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Comparison of vitamin D level in children with type 1 diabetes versus control

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Abstract: *Background:* The most action of vitamin D in body is bone mineral homeostasis.Thereare reports that vitamin D deficiency increases the incidence of type 1diabetes. *Aim:* to investigate the frequency of vitamin D deficiency in children with type 1 diabetes. *Methods and Material:* In this prospective cross sectional study 62 patients with type 1 diabetes and 90 healthy individuals were studied. At the first visit, height, weight, blood pressure and sexual maturation then 25OHD, P, Ca, ALKP in both and HbA1c levels in diabetic patients is assessed. *Results:* In diabetic patients93/6% (n=58) had inadequate and6.5 % (n=4) had adequate level of vitamin D. In the control group, 64/4% (n=58) inadequate and 35.6% (n=32) had adequate levels of vitamin D. *Conclusion:* This study shows with use of vitamin D in children with vitamin D deficiency prevents of Diabetes in future.

Keywords: Vitamin D, diabetes, prevention

Introduction

Although the most essential function of vitamin D is regulating mineral homeostasis of the bone in the body, it affects most of the physiological processes the most important case of which is the body's immune system [1]. Recently, the importance of vitamin D in regulating the release of insulin as well as immune system has increasingly been clarified through identifying the receptors of vitamin D in different tissues including lymphocytes T, macrophages, thymus tissue and the beta pancreatic cells. Considering the function of lymphocytes T, macrophages and the thymus tissue on the immune system process as well as the function of pancreatic beta cells on the release of vitamin D and the presence of vitamin D receptors in immune cells on the one hand and pancreatic cells on the other, the function of vitamin D in creating insulin, immune process and the tie between them can be indicated [1].

The deficiency of vitamin D can lead to an increase in the incidence of diabetes types one and two, multiple sclerosis and different types of cancer including colon, breast and prostate. Possible causes of the deficiency of vitamin D include decreasing syntheses of the skin and inadequate consumption of vitamin D, either due to the lack of nutrients or supplements containing vitamin D [2]. Diabetes type one is an autoimmune disease that is one of the most common chronic diseases of childhood. With the exception of some genes that are involved in the creation of disease, other causes of type 1 diabetes have not been identified clearly. In the recent years there has been a special interest in checking out the regulating role of immune system of vitamin D in type 1 diabetes as well as the other auto-immune diseases. Finding out the physiological role of vitamin D, particularly its potential effects in inflammatory and auto-immune conditions and also in insulin secretion and probably in resistance against that, results in the inclination to check out its potential role in control and prevention of type 1 and 2 diabetes.

In fact, considering the studies on human and animal samples, there is an hypothesis that adequate amount of vitamin D reduces the incidence of type1 diabetes, besides it can help to control and ameliorate metabolism in case of having diabetes. In recent decades important views have been stated regarding

the role of vitamin D. in addition to the role of vitamin D in metabolism of calcium, its shortage increases the risk of catching diseases out of skeletal system. The increase in receiving vitamin D has been mentioned as an essential factor in preventing diabetes [2].

It seems that changing the reception of vitamin D has had an important role in increasing the prevalence of diabetes in recent decade. Vitamin D can play an important role in pathogeneses of type 1 and 2 diabetes by affecting the sensitivity to insulin or the function of beta cells of pancreatic islets. There is also evidence that vitamin D has a determining role in preventing the loss of beta cells in pancreatic islets and the improvement of graft in the cells [3]. This function is important in the creation of insulin. Moreover, low amount of vitamin D has been mentioned to have a negative effect on the function of beta cells in pancreases. On the other hand, regular consumption of vitamin D in incipient years of one's life has been mentioned as a factor in decreasing the risk of progression of diabetes type1 [3]. This study attempts to investigatethe prevalence of deficiency in vitamin D in children suffering from type 1 diabetes in Hamedan.

Material and Methods

In this study, carried out in the form of case-control in the glandular clinics of children in Hamedan from 2012 to 2014, 62 patients suffering from type 1 diabetes aged 7-20 were examined. The average of the age of patients was 14.5, among which 27 of them were boys and 35 were girls. These people formed 40.8 percent of the subjects. None of the patients used the supplement of vitamin D in the last 6 month. The control group consisted of 90healthy people (49 girls and 41 boys with the average age of 3-15). These people were not obese or overweight and didn't use the supplement of vitamin D in the last 6 month. This group formed 59.2 percent of our subjects. The control group also was identical with the case group in age and gender. In the first visit height, weight, blood pressure and the state of maturity were examined in both groups. Then, the amount of calcium, phosphor, alkaline phosphatase and 250HD in both groups and HbA1c in diabetic patients were evaluated. The state of vitamin D has been defined based on AAP. Deficiency of vitamin D is applied to serum level of less than 10 Nano gram in CC (Ng/CC).

The level of vitamin D between 10-30 Nano gram in CC is considered as inadequate and the level of over 30 Nano gram in CC as adequate. The level of over 100 Nano gram in CC is considered excess of vitamin D and over 150Nano gram in CC poisoning with that. The level of vitamin D was measured through Electro chime luminescence (ECL) method. The level of calcium, phosphor, and alkaline phosphate was measured through chime Enzyme. The level of HbA1c was also measured through electro chime luminescence method (ECL). The level of HbA1c between 6.5-8 good, 8-9.9 average and above 9.9 was mentioned as a weak control of blood sugar. The statistical analyze was carried out through SPSS method. The average of measurement was evaluated through student's test and ANOVA. The results were stated in the form of standard deviation +- average (SD+-MEAN). A (P value) less than 0.05 was considered significant.

Results

The serum level 250HD was the average of 23.84 in the subjects, the least amount of which was 4.9 and the most was 90Nano mole in liter (N mole/lit). In people suffering from type 1 diabetes the average level of vitamin D was 16.25 the least amount of which was 4.9 and the most was 38.9. In the control group the average of vitamin D was 29.07 the least amount of which was 10.3 and the most was 90 (Table1).

Table-1: Level of Vitamin d3 in study population

Vitamin D3	Frequency	Mean± Sd	Minimum	Maximum
Case	62	16.25 ±8.09	4.9	38.9
Control	90	29.07± 16.06	10.3	90

The serum level of 250HD in 76.3 percent of the subjects showed deficiency or inadequacy of that. 9.2 percent had deficiency and 67.1 percent had inadequacy of vitamin D. The level of 250HD was normal in 23.7 percent of the patients. None of the patients had excess of vitamin D. in people suffering from diabetes 93.6 percent had deficiency of vitamin D or inadequacy of that. (n=58) 6.5 percent of the patients had adequate level of vitamin D (n=4). In healthy subjects 64.4 percent (n=58) had inadequate level of vitamin D and none of the patients had deficiency of vitamin D.35.6 percent (n=32) had adequate level of the vitamin. In this study, in the case group only 4 people (6%/5) had adequate level of vitamin D, while in the control group 32 people (35%/6) had this level. The relationship was statistically significant, considering K2test (Pvalue000) (Table2).

Table-2: Frequency of Vitamin D3 level in his series

Vitamin D3 level	Frequency		Percent		P value
	case	control	case	control	
10 >	14	0	22.6	0	0.00
10-30	44	58	71	64.4	
30 <	4	32	6.5	35.6	
Total	62	90	100	100	

Table-3: Mean of lab tests in these cases

	Mean± Sd	Mean± Sd	Minimum	Minimum	Maximum	Maximum	P value
Vitamin D	16.25 8.09	29.0 16.0	4.9	10.3	38.9	90	0.00
HBA1C	7.9 2.1	-	5	-	13.99	-	-
CA	9.6 1.0	9.8 0.9	7.6	8.3	11.3	11.8	0.35
PHOS	5.6 0.8	5.6 0.9	3.9	3.7	7.3	7.1	0.91
ALP	210.8 65.1	188.4 63.3	79	70	310	306	0.03

In the people suffering from diabetes there was no meaningful relationship between the level of vitamin D and the amount of HbA1c. (P value=0.121) in addition, there was no meaningful relationship between the level of vitamin D and the levels of alkaline phosphatase serum, calcium and phosphor in people suffering from diabetes. In the control group there was a meaningful relationship between the level of vitamin D and alkaline phosphatase (P valu0.061), but there was none between the level of vitamin D with calcium and phosphor in this group (Table 3).

Discussion

Considering the investigations in our study, we can conclude that the shortage of vitamin D is way more in diabetic patients than healthy people and it seems that the shortage of vitamin D is risky for the people inclined to diabetes. In the recent years, studies have shown that the shortage of vitamin D is related to the intensity and frequency of type 1 diabetes and the supplement of vitamin D cannot reduce progression of the disease. Although the number of studies regarding the amount of vitamin D in children and teenagers suffering from type 1 diabetes are limited, the frequency has high variation from 15% to 90.6% [4-5]. It has been reported that diabetes type 1 patients has low level in comparison with the control group [6].

In this study it was observed that 22%/6 of diabetic patients have vitamin D disorder and it is similar to the study of Mutlu in which there was disorder in 38% of the patients [7]. Moreover, in this study only 5%/6 of the diabetic patients had adequate level of vitamin D, the rest of them had deficiency and

disorder. In the study carried out by Bin-Abbas and his associations it was revealed that the serum level of vitamin D in the children suffering from type 1 diabetes is significantly lower than the control group [8]. In the study carried out by Thnco and his associations it was manifested that there is lack of adequacy in 28% of cases, shortage of the level of vitamin D in 43% and the normal level in 29% [9]. In our study in the diabetic children in 44 cases (71%) inadequate level, in 14 cases (22.6%) deficiency and only in 4 cases (6.5%) adequate level of vitamin D was reported. In the control group in 58 cases (64.4) inadequacy, in zero case (0%) deficiency and in 32 cases (35.6%) adequate level of vitamin D was reported. With regard to the mentioned studies and our findings, the level of vitamin D in type1 diabetic children was lower than other people of the same age. In the study of Aljabris and his associations it was stated that the supplements of vitamin D have a determining role in controlling glycemic conditions in type 1 diabetic patients. It was revealed that in the patients who have higher vitamin D than the other ones, the level of glycosylated hemoglobin is in a more favorable level [10].

On the other hand, in a study carried out by El Baba and his associations it was manifested that there is a faint relationship between the level of vitamin D and the amount of HbA1c at the end of sunny months than the cloudy ones. As it was mentioned the level of vitamin D and glycosylated hemoglobin had higher levels at the end of sunny months than the cloudy ones [11]. While in our study there was no meaningful relationship between the level of vitamin D and glycosylated hemoglobin. (P value=0.121) in the study carried out by Vojta Kova no meaningful difference was reported in the shortage of vitamin D, phosphor, calcium and glycosylated hemoglobin in type 1 diabetic children [12]. In our study also there was no meaningful difference between the level of vitamin D, phosphor, calcium and glycosylated hemoglobin. In the study by Janner M [13] it was stated that the level of alkaline phosphatase is higher in the people with deficiency than in people with the proper level. (P value=0.4). Mohammadian S et al measured level of vitamin D and HbA1C In children with type I diabetes mellitus. He showed Mean ± SD HbA1C was 9.73±1.85 before the study which was diminished to 8.55±1.91 after vitamin D3 supplement treatment. This decline has a significant difference (p-value < 0.0001). Mean ± SD 25OHD was 17.33±8.97 nmol/lit before the study which is increased to 39.31±14.38 nmol/lit after treatment with vitamin D3 supplement. This increase also has a significant difference (p-value < 0.0001). Vitamin D3 supplement causes the improvement of HbA1C in all groups of glycemic control including HbA1C <7.8, 7.8-9.9, and >9.9. This supplement transfer patients toward better glycemic control for the entire group (p-value < 0.0001). He concluded Vitamin D3 supplement improves HbA1C in pediatrics with type I diabetes mellitus and vitamin D deficiency [14].

Azab SF and coworkers [15] in a case-control study including 80 T1DM diagnosed cases aged 6 to 16 years and 40 healthy children with comparable age and gender as the control group. Compared to the control group, serum vitamin D levels were not significantly lower in diabetic subjects (24.7±5.6 vs 26.5±4.8 ng/ml; P>0.05). Among diabetic cases 44 (55%) were vitamin D deficient; meanwhile 36 (45%) cases had normal vitamin D level (P<0.01). In addition, 26 (32.5%) diabetic cases had 2ry hyperparathyroidism and 54 (67.5%) cases had normal parathyroid hormone level; meanwhile, none of the control group had 2ry hyperparathyroidism (P<0.01). he found a significant difference between vitamin D deficient diabetic cases and those with normal vitamin D level as regards HOMA-IR and diabetes duration (P<0.01). He concluded vitamin D status; especially in diabetic children and adolescents, should be disseminated to the public.

Conclusion

Considering the findings in the study, it can be said that vitamin D in type 1 diabetic patients is considerably lower than the identical healthy group, according to the findings of Mutlu, Vojtakova, Thnco and BinAbbas. Thus, we can bear in mind thatdiabetes can probably be prevented by taking the supplement of vitamin D regularly by people who have deficiency. This also can control the blood sugar in the diabetic patients.

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