EVALUATION OF THE RELATIONSHIP BETWEEN METABOLIC PARAMETERS, AND VITAMIN D LEVELS IN CHILDREN WITH INSULIN-DEPENDENT DIABETES MELLITUS

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Introduction

Type 1 Diabetes Mellitus (T1DM) is one of the most common chronic diseases of childhood and is caused by partial or absolute insulin deficiency due to the destruction of the beta cells of the pancreas (1). It has been reported in epidemiological studies that there is a high prevalence of vitamin D deficiency in children and adolescents with T1DM and a relationship between both (2). Vitamin D has anti-inflammatory and immunomodulatory effects that may affect the autoimmune pathology of T1DM (4). Epidemiological studies suggest an inverse relationship between circulating 25OHD levels and coronary vascular disease risk biomarkers, including the atherogenic lipid profile (5). It has been suggested that Vitamin D has both direct and indirect effects in changing lipid profile by increasing lipoprotein lipase activity in adipose tissue and decreasing serum levels of triglycerides (TG) (6).

It is thought that the effect of vitamin D deficiency on cardiac and metabolic complications in children with type 1 diabetes mellitus and this situation should be examined in detail with additional values. Therefore, to examine whether there is a deficiency in vitamin D levels of children diagnosed with T1DM; It was aimed to calculate and compare the values such as insulin use dose, HbA1C level, blood pressure levels, AIP used to detect hyperlipidemia in those with deficient and normal vitamin levels and were not observed in children with diabetes in the literature. In the study, it was aimed to determine the low vitamin D level and high AIP value seen as important risk factors for cardiovascular events in children with T1DM and to evaluate their usability as a marker in long-term follow-up in these patients.

Methods

A total of 307 T1DM patients who were followed up in the pediatric endocrinology outpatient clinic, 249 and 58 who were not checked for vitamin D levels were retrospectively included in the study. While 193 of the patients had vitamin D deficiency, this level was found to be normal in 56 patients. Vitamin D levels were considered deficient in those below 20 ng/mL (7).

Anthropometric measurements ,Ipubertal stage and laboratory data were recorded. Datas were analysed according to sex age appropiate percentile s and SDS references.

Systolic and diastolic blood pressure limits were analyzed from tables determined according to height percentile and age. Those with a blood pressure level above the 95th percentile were considered hypertensive (13).

HbA1C, lipid profile (Total cholesterol, TG, low-density lipoprotein (LDL), high-density lipoprotein (HDL)), and vitamin D levels were recorded at the first admission and follow-up of patients with type 1 diabetes mellitus.

The Atherogenic Index (AIP) was calculated as log (TG/HDL-C). Those with AIP ratios of 0.11 and below were considered at low risk; those >0.11 and ≤0.21 at medium risk and AIP >0.21 at high risk (14).

Results

In our study, there were 307 diabetic patients, 152 (49.5%) females and 155 (50.5%) males, whose ages ranged from 2.1 to 18 (Mean = 11.52±3.87).

When the BMI of the cases with and without vitamin D deficiency was examined, the mean BMI of the cases with vitamin D deficiency was 19.50±5.74 kg/m², while the cases without vitamin D deficiency were calculated as 18.57±8.12 kg/m². It was observed that there was no significant difference between the means of the groups (p>0.05).

In our study, while 77.5% (n=193) of the patients whose vitamin D level was checked had vitamin D deficiency, this level was normal in 22.5% (n=56). In patients with low vitamin D levels, the mean insulin dose was 0.91±0.31 U/kg/day, and the mean HbA1C level was 11.7%; In normal cases, it was 0.94±0.28 U/kg/day, and the mean HbA1C level was 12.1%. When the insulin use dose and the mean HbA1C value are compared in cases with low and normal vitamin D levels, it is seen that there is no significant difference (p>0.05).

When the AIP levels of the patients were classified according to puberty and gender, a significant difference was found in AIP levels in the prepubertal and pubertal groups ($\chi^2(2)=10.34$, p<0.01). While the mean AIP value of prepubertal patients is 0.18±0.33, it is 0.31±0.30 in pubertal patients. On the contrary, there is no significant difference in the AIP levels of males and females (p>0.05). While the mean AIP value in females is 0.28±0.33, the mean AIP value in males is 0.25±0.31. Table 1 can be examined for detailed information.

Table 1: Classification of Atherogenic Index Levels of Patients According to Puberty and Gender

		Atherogenic Index Level			Total
		Low	Medium	High	
Prepubertal	n	43	15	38	96
	%	44,8	15,6	39,6	
Pubertal	n	47	37	98	182
	%	25,8	20,3	53,8	
Total	n	90	52	136	278
	%	32,4	18,7	48,9	
Female	n	42	27	64	133
	%	31,6	20,3	48,1	
Male	n	48	25	72	145
	%	33,1	17,2	49,7	
Total	n	90	52	136	278
	%	32,4	18,7	48,9	

The results obtained when comparing the HbA1C value of the patients with high atherogenic index in the first year and those of the patients with normal and low AIP show that there is a significant difference ($F(2,250)=3.87$, p<0.05). It is observed that the mean HbA1C value of the patients with low AIP levels in the first year is significantly lower than that of the patients with high AIP levels. Table 2 can be examined for detailed information.

When the mean AIP values of the cases with and without vitamin D deficiency were examined, the mean AIP of the cases with vitamin D deficiency was 0.29±0.31, while this rate was calculated as 0.13±0.28 in those with normal vitamin D deficiency. The results obtained show that there is a significant difference between the two groups (p<0.001).

Table 2: First-Year HbA1C Values of Cases with High Atherogenic Index, Medium and Low Risk

Level	Mean	S	n	95% Confidence Interval	
				Lowest	Highest
Low	11,34	2,81	82	10,72	11,95
Medium	11,94	3,18	47	11,13	12,76
High	12,46	2,73	124	11,96	12,96
Total	12,00	2,88	253	-	-

When the mean systolic and diastolic blood pressure of the cases with and without Vitamin D deficiency were examined, the mean systolic-diastolic blood pressure of the vitamin D deficient cases was 103.94±11.24/65.31±8.91 mmHg; in cases without vitamin D deficiency, mean systolic-diastolic blood pressure was calculated as 104.11±10.62/64.64±9.53 mmHg. The results show that there is no significant difference in the mean systolic and diastolic blood pressure of the cases with and without vitamin D deficiency (p>0.05).

When the mean systolic and diastolic blood pressure of the cases with low atherogenic index, medium and high risk are examined, the mean systolic-diastolic blood pressure of the cases with low AIP value is 103.50±11.67/64.44±8.72 mmHg; the mean systolic-diastolic blood pressure of the cases with moderate AIP value was 102.88±10.40/65.77±10.01 mmHg; the mean systolic-diastolic blood pressure of the cases with a high risk of AIP was found to be 105.59±10.89/65.59±9.09mmHg. The results show that there is no significant difference between the mean systolic and diastolic blood pressure of cases with low atherogenic index, medium and high risk (p>0.05).

When the mean of TG, cholesterol, HDL, and LDL values of the cases with and without vitamin D deficiency was examined, it was observed that the TG levels of the cases with vitamin D deficiency were significantly higher ($t(236)=-4.09$, p<0.001). However, there was no significant difference between the groups in terms of cholesterol, HDL, and LDL means (p>0.05). Table 3 can be examined for detailed information.

Table 3: TG, Cholesterol HDL and LDL Values of Cases with and without Vitamin D Deficiency

Vitamin D Level	Variables	n	Lowest Value	Highest Value	Mean	S
Low	TG(mmol/L)	185	1.27	54	6.66	5.18
	Cholesterol(mmol/L)	185	4.94	20.2	9.41	2.37
	HDL(mmol/L)	183	0.85	5.98	2.95	0.75
	LDL(mmol/L)	183	0.99	11.7	5	1.82
Normal	TG(mmol/L)	53	1.55	12.4	4.55	2.27
	Cholesterol(mmol/L)	53	5.66	14.11	9.1	1.95
	HDL(mmol/L)	52	1.41	7.33	3.16	0.91
	LDL(mmol/L)	52	1.78	8.25	5	1.5

Conclusions

AIP was higher in patients with vitamin D deficiency. According to the data obtained as a result of the study; low vitamin D and high AIP levels are important predictors of cardiovascular complications. It is thought that close monitoring of these parameters will be a guide in preventing long-term morbidity in children with T1DM.

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