THE EFFECT OF VITAMIN D SUPPLEMENTATION ON METABOLIC SYNDROME PARAMETERS IN OVERWEIGHT AND OBESE CHILDREN AND ADOLESCENTS IN GREECE

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INTRODUCTION

The prevalence of obesity has increased dramatically in Greece in the last decades, and more than 30% of children and adolescents are currently overweight or obese. Accumulating evidence suggests the association of vitamin D deficiency with obesity and other metabolic syndrome parameters.

OBJECTIVES

The aim of our study was to investigate the effect of vitamin D supplementation on metabolic syndrome parameters in overweight and obese children and adolescents.

METHODS

Two hundred thirty two (n=232) obese children and adolescents aged [mean ± standard deviation (SD)] 10.24 ± 2.50 years were studied prospectively for one year. Subjects were randomly assigned to either the intervention (n=117) or the control group (n=115). Participants in the intervention group received 50,000 IU vitamin D weekly for 6 weeks and were subsequently placed on maintenance dose. Blood samples for determination of 25(OH)D, bone profile and cardiometabolic parameters were obtained at baseline and 12 months later. Systolic and diastolic blood pressure were determined twice and the mean was calculated.

Table 1: Clinical characteristics at baseline and at the end of the study

Variables	Vitamin D treatment (N=109)			Control (N=111)			$P_{between\_baseline}$	$P_{between\_12\ months}$	P_{time}	P_{group}	$P_{timexgroup}$
	Baseline	12 months	p_{within}	Baseline	12 months	p_{within}					
Weight (kg)	55 (43.65, 68.85)	63.30 (51.45, 76.85)	**<0.001***	56.30 (44.20, 71)	63 (51.80, 78.80)	**<0.001***	0.669•	0.832•	0.165	0.277	0.101
Height (cm)	145.78 ± 13.95	155.66 ± 18.30	**<0.001**	144.96 ± 15.71	155.61 ± 14.58	**<0.001**	0.683	0.980	0.196	0.789	0.154
BMI (kg/m²)	25.10 (23.20, 28.70)	25 (23.10, 28.15)	0.272*	26 (24.40, 29.50)	26.10 (23.60, 29.20)	0.182*	0.059•	0.132•	**0.001**	**0.016**	0.749
SBP (mmHg)	111.30 ± 10.72	114.53 ± 11.54	**0.015**	110.71 ± 11.99	114.55 ± 10.22	**0.004**	0.713	0.992	0.437	0.616	0.309
DBP (mmHg)	64.30 ± 9.99	68.31 ± 7.79	**0.001**	63.08 ± 10.06	68.78 ± 8.69	**0.004**	0.391	0.694	**<0.001**	0.392	0.268
MAP (mmHg)	79.96 ± 8.69	83.63 ± 7.62	**<0.001**	78.92 ± 9.08	84.04 ± 8.26	**0.001**	0.405	0.727	**0.002**	0.366	0.194
Waist (cm)	81 (75, 90)	85 (78, 91.25)	**0.006***	83 (76, 92)	85.25 (77.50, 95.25)	**0.011***	0.475•	0.480•	0.072	0.607	0.353
Hip (cm)	86 (80.50, 99)	95 (87, 101.50)	**<0.001***	90 (80, 101)	93.75 (87, 104.13)	**<0.001***	0.317•	0.985•	0.429	0.101	0.683
WHratio	0.93 (0.89, 0.98)	0.90 (0.87, 0.94)	**0.001***	0.93 (0.88, 0.98)	0.91 (0.86, 0.96)	**0.004***	0.837•	0.491•	0.107	0.732	0.828
Fat Mass (kg)	17.70 (14.23, 23.13)	20.50 (16, 26.60)	**0.003***	20.30 (15.30, 26)	21 (16.55, 28.05)	**0.012***	0.070•	0.435•	0.062	**0.007**	0.710
Muscle Mass (kg)	33.65 (27.30, 42.93)	39.60 (32.60, 47.10)	**<0.001***	33.90 (28.40, 40.35)	39 (32.25, 48.10)	**<0.001***	0.793•	0.994•	0.352	0.385	0.090
Bone Mass (kg)	1.91 ± 0.54	2.27 ± 0.66	**<0.001**	1.94 ± 0.49	2.48 ± 0.73	0.074	0.721	0.466	0.648	0.802	0.236

Table 2: Biochemical and endocrinologic parameters at baseline and at the end of the study

Variables	Vitamin D treatment (N=109)			Control (N=111)			$P_{between\_baseline}$	$P_{between\_12\ months}$	P_{time}	P_{group}	$P_{timexgroup}$
	Baseline	12 months	p_{within}	Baseline	12 months	p_{within}					
Glucose (mg/dL)	78.10 ± 9	81.91 ± 9.44	**0.001**	79.22 ± 7.82	82.27 ± 7.65	**0.002**	0.328	0.759	**0.019**	0.319	0.604
Insulin (μUI/mL)	14.21 (9.72, 19.30)	15.72 (10.96, 22.55)	**0.032***	14.50 (9.73, 20.45)	14.07 (10.02, 21.07)	0.623*	0.759•	0.183•	**0.007**	0.238	**0.037**
HbA1c (%)	5.30 ± 0.25	5.21 ± 0.25	**<0.001**	5.31 ± 0.23	5.23 ± 0.28	**<0.001**	0.778	0.433	0.999	0.999	0.063
HOMA-IR	2.80 (1.83, 3.65)	3.23 (2.20, 4.74)	**0.002***	2.95 (1.90, 4.07)	2.92 (2.06, 4.29)	0.771*	0.544•	0.288•	0.213	0.511	0.117
QUICKI	0.33 (0.32, 0.35)	0.32 (0.30, 0.34)	**0.003***	0.33 (0.31, 0.35)	0.33 (0.31, 0.34)	0.308*	0.544•	0.288•	0.843	0.467	0.196
Cholesterol (mg/dL)	160.69 ± 24.14	155.24 ± 26.21	**0.015**	154.77 ± 27.06	151.53 ± 24.61	0.134	0.090	0.281	0.746	**0.038**	0.531
Triglycerides (mg/dL)	73.50 (55, 92)	65 (48.50, 90)	0.146*	68.50 (52, 102)	65 (49, 88)	**0.045***	0.575•	0.703•	0.999	0.177	0.317
HDL (mg/dL)	50.31 ± 11.42	54.50 ± 12.30	**<0.001**	47.76 ± 9.91	53.41 ± 11.67	**<0.001**	0.081	0.497	**<0.001**	**0.033**	0.269
LDL (mg/dL)	93.84 ± 22.40	86.68 ± 21.61	**<0.001**	91.23 ± 23.60	84.20 ± 21.27	**<0.001**	0.402	0.392	**0.025**	0.258	0.994
PTH (pg/mL)	32.33 (26.25, 41.64)	34.90 (27.29, 45.29)	0.109*	32.41 (26.07, 40.06)	38.30 (28.79, 47.68)	**<0.001***	0.591•	0.125•	**<0.001**	0.154	0.229
Total 25-OH-Vitamin D (ng/mL)	19.19 ± 5.92	24.59 ± 6.30	**<0.001**	19.35 ± 5.74	21.81 ± 6.54	**0.002**	0.839	**0.006**	**0.007**	**0.004**	**0.011**

RESULTS

Overall, 220 eligible children and adolescents completed the study (109 in the intervention group and 111 in the control group). A significant decrease was noted in the BMI (p=0.001) over the study period, with the intervention group demonstrating significantly lower BMI compared with the control group (p=0.016) (**Table 1**). Moreover, the intervention group had significantly lower fat mass (p=0.007) and higher HDL concentrations (p<0.05) compared with the control group. No significant differences were noted between groups over the study period in relation to arterial blood pressure, HbA1c (%), HOMA-IR and QUICKI (**Table 2**).

CONCLUSIONS

Vitamin D supplementation may have beneficial effects on alleviating certain complications of childhood obesity. We recommend determination of vitamin D concentrations in obese children and adolescents, and appropriate correction of Vitamin D insufficiency or deficiency.

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