



# THE PREVALENCE OF 25-HYDROXYVITAMIN D INSUFFICIENCY AND DEFICIENCY AMONG OVERWEIGHT AND OBESE CHILDREN AND ADOLESCENTS IN GREECE



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## BACKGROUND

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. Obesity is associated with decreased circulating 25-hydroxyvitamin D concentrations, which might predispose subjects to metabolic syndrome and cardiovascular morbidity and mortality.

## OBJECTIVE AND HYPOTHESES

To determine serum 25-hydroxyvitamin D concentrations and their relationship to cardiometabolic parameters in overweight and obese children and adolescents.

## METHODS

Three hundred fifty (n=350) children and adolescents [197 females (F), 153 males (M)] were recruited to participate in the study during the autumn months. Of those, 34 had normal body mass index (BMI) (age:  $9.66 \pm 0.47$  yr; BMI:  $20.04 \pm 0.39$  kg/m<sup>2</sup>, F: 26, M: 8), 111 were overweight (age:  $10.23 \pm 0.27$  yr; BMI:  $23.02 \pm 0.31$  kg/m<sup>2</sup>, F: 64, M: 47) and 205 were obese (age:  $10.28 \pm 0.23$  yr; BMI:  $28.48 \pm 0.38$  kg/m<sup>2</sup>, F: 107, M: 98). Blood samples for determination of liver and renal function, 25-hydroxyvitamin D, bone profile and cardiometabolic parameters were determined at 08:00h following a 12-hour fast. Systolic and diastolic blood pressure was determined twice and the mean was calculated (Table 1). The study was approved by the local Committee on the Ethics of Human Research. Comparisons among groups were performed using one-way analysis of variance.

Table 1: Clinical characteristics and endocrinologic parameters

	Normal	Overweight	Obese	P
Age (yr)	$9.66 \pm 0.47$	$10.29 \pm 0.27$	$10.28 \pm 0.29$	NS
Weight (kg)	$40.82 \pm 2.09$	$49.17 \pm 1.37$	$62.79 \pm 1.68$	<0.001
Height (cm)	$145.75 \pm 5.81$	$143.08 \pm 1.49$	$145.39 \pm 1.28$	NS
BMI (Kg/m <sup>2</sup> )	$20.39 \pm 0.39$	$23.03 \pm 0.31$	$28.48 \pm 0.38$	<0.001
WHR	$0.93 \pm 0.40$	$1.00 \pm 0.24$	$0.98 \pm 0.16$	NS
BP <sub>SYST</sub> (mmHg)	$101.44 \pm 3.55$	$105.16 \pm 2.37$	$100.19 \pm 2.46$	NS
BP <sub>DIAST</sub> (mmHg)	$56.5 \pm 2.24$	$58.23 \pm 1.48$	$57.03 \pm 1.51$	NS
Glucose (mg/dl)	$76.06 \pm 1.50$	$75.97 \pm 0.99$	$74.81 \pm 1.01$	NS
Insulin ( $\mu$ IU/ml)	$8.79 \pm 0.73$	$11.98 \pm 0.84$	$18.69 \pm 2.60$	<0.05
CHOL (mg/dl)	$161.03 \pm 3.66$	$159.3 \pm 3.22$	$156.14 \pm 2.43$	NS
TGL (mg/dl)	$73.44 \pm 5.59$	$74.59 \pm 3.71$	$79.87 \pm 2.72$	NS
LDL (mg/dl)	$90.56 \pm 2.90$	$91.04 \pm 2.67$	$91.23 \pm 1.80$	NS
HDL (mg/dl)	$55.76 \pm 2.27$	$53.33 \pm 1.41$	$48.61 \pm 0.87$	<0.001
APOA1 (mg/dl)	$140.59 \pm 5.38$	$141.95 \pm 2.34$	$134.34 \pm 2.37$	NS
APOB (mg/dl)	$68.79 \pm 2.96$	$70.14 \pm 1.81$	$70.26 \pm 1.53$	NS
LpA (mg/dl)	$14.67 \pm 2.64$	$18.24 \pm 2.23$	$15.67 \pm 1.66$	NS
PTH (pg/ml)	$31.93 \pm 2.70$	$33.49 \pm 1.61$	$33.56 \pm 1.60$	NS
25OHVit D (ng/ml)	$24.06 \pm 1.48$	$23.94 \pm 0.84$	$21.48 \pm 0.61$	<0.03

Values indicate mean  $\pm$  SEM

## RESULTS

The concentrations of 25-hydroxyvitamin D were sufficient ( $\geq 30$  ng/mL;  $36.87 \pm 0.7$  ng/mL) in 63 (18%) children and adolescents, insufficient (20-29 ng/mL;  $24.5 \pm 0.24$  ng/mL) in 132 (37.71%) and deficient ( $< 20$  ng/mL;  $14.98 \pm 0.29$  ng/mL) in 155 (44.28%) subjects (Figure 1). Serum 25-hydroxyvitamin D concentrations were significantly lower in overweight and obese children and adolescents compared with their normal counterparts (Normal BMI:  $24.06 \pm 1.48$  ng/mL; Overweight:  $23.94 \pm 0.84$ ; Obese:  $21.48 \pm 0.61$  ng/mL,  $P < 0.03$ ).

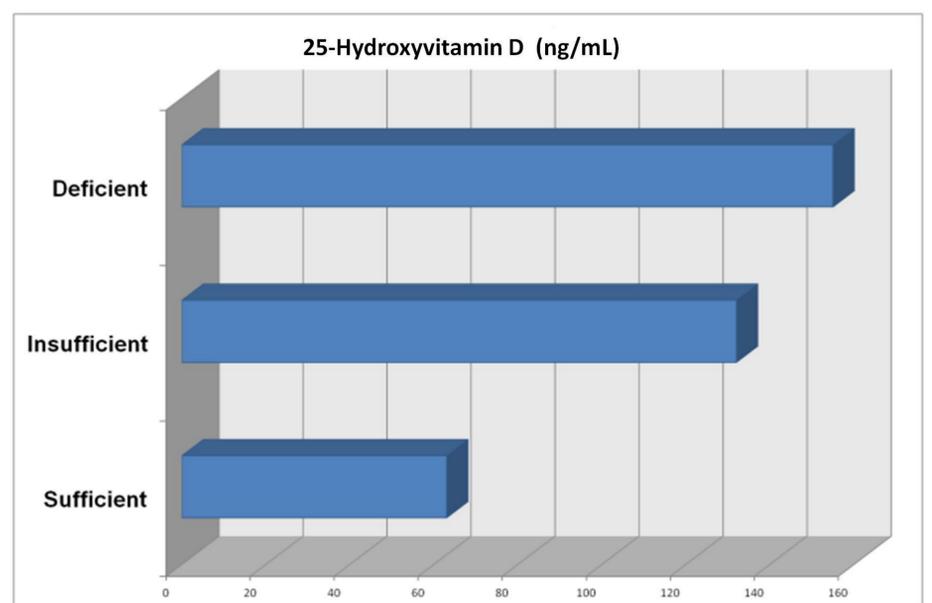


Figure 1: Concentrations of serum 25-hydroxyvitamin D in the study population

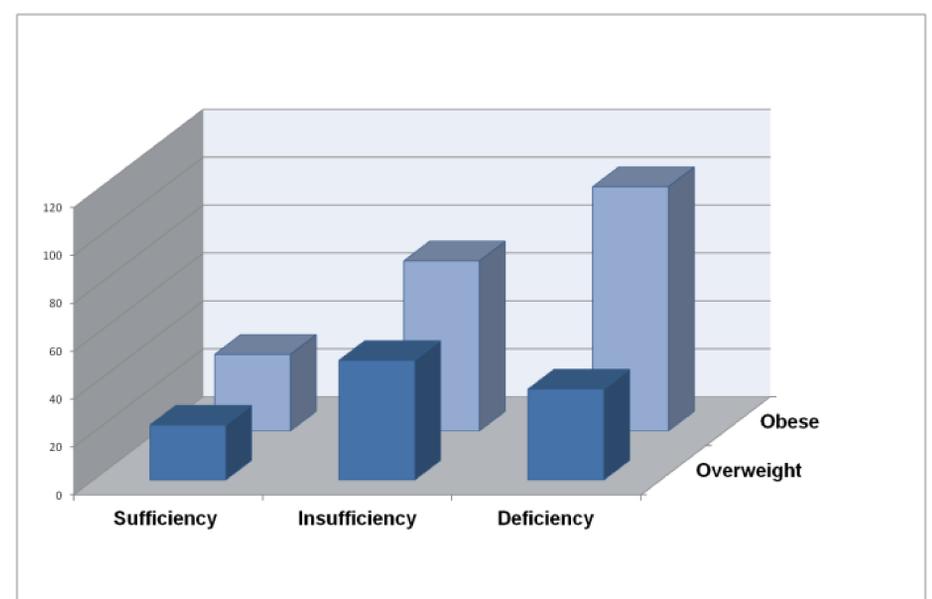


Figure 2: Prevalence of 25-hydroxyvitamin D insufficiency and deficiency among overweight and obese children and adolescents

## CONCLUSIONS

Our findings indicate that 25-hydroxyvitamin D insufficiency or deficiency is observed in 82.5% of overweight and obese children and adolescents in Greece (Figure 2).