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## Thyroid function in overweight and obese children and adolescents

[Eleni Ramouzi](#)<sup>1</sup>, [Konstantina Sveroni](#)<sup>1</sup>, [Maria Manou](#)<sup>1</sup> & [Evangelia Charmandari](#)<sup>1,2</sup>



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Author affiliations

<sup>1</sup>Outpatient Clinic for the Prevention and Management of Overweight and Obesity, Division of Endocrinology, Metabolism and Diabetes, First Department of Pediatrics, 'Aghia Sophia' Children's Hospital, Athens, Greece; <sup>2</sup>Division of Endocrinology and Metabolism, Center of Clinical, Experimental Surgery and Translational Research, Biomedical Research Foundation of the Academy of Athens, Athens, Greece

**Background:** Obesity in childhood and adolescence represents one of the most challenging public health problems of our century. The prevalence of overweight and obesity in Greece is approximately 21% in children younger than 6 years and up to 40% in older children and adolescents. Mild elevations of TSH concentrations are often detected in obese children and adolescents.

**Aim:** To investigate the thyroid function in overweight and obese children and adolescents.

**Methodology:** We studied three thousand and ten ( $n=3,010$ ) children and adolescents aged 2-18 years (mean age  $\pm$  SD:  $10.236 \pm 3.011$  years) attending our 'Out-patient Clinic for the Prevention and Management of Overweight and Obesity in Childhood and Adolescence'. Subjects were classified as obese ( $n=1,710$ ; 56.8%), overweight ( $n=834$ , 27.7%) or as having normal body mass index (BMI) ( $n=466$ , 15.5%) according to the International Obesity Task Force cutoff points. All subjects were evaluated by a multidisciplinary team at frequent intervals, and received personalized guidance on diet and exercise. Detailed clinical evaluation and laboratory investigations were performed at each clinic visit.

**Results:** Obese subjects had significantly higher systolic and diastolic blood pressure, as well as significantly higher concentrations of fasting plasma glucose and serum insulin, HbA1C, triglycerides, LDL-cholesterol, uric acid and ApoB, and significantly lower concentrations of HDL-cholesterol, ApoA1 and Vitamin D than their overweight and normal-BMI counterparts. Furthermore, obese children and adolescents had significantly higher TSH (mean  $\pm$  SD:  $2.9 \pm 1.4$  mIU/l,  $P<0.005$ ) and T3 (mean  $\pm$  SD:  $146,5 \pm 31.4$  ng/dl,  $P<0.001$ ) concentrations compared with overweight and normal-BMI subjects. An increase in age by one year was associated with a decrease in FT4 concentrations by  $0.007$  ng/dL (95%CI,  $-0.007$ ,  $-0.009$ ,  $-0.003$ ), in T3 concentrations by  $3.847$  ng/dL (95%CI,  $-3.847$ ,  $-4.484$ ,  $-3.210$ ) and in TSH concentrations by  $0.051$  mIU/l (95%CI,  $-0.051$ ,  $-0.083$ ,  $-0.019$ ) when all other variables remained constant. Compared with normal-BMI subjects, overweight subjects demonstrated an increase in T3 concentrations by  $5.9$  units (95%CI,  $5.905$ ,  $1.986$ ,  $9.825$ ), while obese subjects had an increase in T3 concentrations by  $9.9$  units (95%CI,  $9.874$ ,  $6.007$ ,  $13.741$ ) when all other variables remain constant.


**Conclusions:** Impaired thyroid function may be often seen in children and adolescents with overweight and obesity, and may change following weight loss. Further studies are required to investigate the possible association of thyroid hormones with cardiovascular risk factors in obese and overweight children and adolescents.

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