

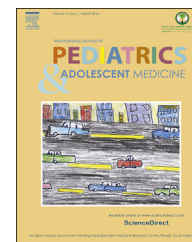
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Original Research Article

Regional differences in the prevalence of underweight, overweight and obesity among 13-year-old adolescents in Greece

q10 Dimitrios Poulimeneas ^{a,1}, Maria G. Grammatikopoulou ^{a,*,1},
Leonidas Dimitrakopoulos ^b, Emma Kotsias ^a,
Dina Gerothanasi ^a, Efstratios R. Kyranas ^a, Maria Tsigga ^a

^a Department of Nutrition & Dietetics, Alexander Technological Educational Institute, Sindos, Thessaloniki, Greece

^b Directorate of Secondary Education, Thessaloniki, Greece

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KEYWORDS

Central obesity;
Abdominal obesity;
Waist circumference;
Weight status;
Adolescence;
Obesity surveillance

Abstract Objective: To assess regional differences in the weight status and abdominal obesity among 13-year-old Greek adolescents.

Design and setting: Cross-sectional, nationwide study in Greece.

Subjects and methods: A representative sample of 4833 13-year-old adolescents (50.7% boys) was recruited throughout the nine regional districts of Greece from 2010 to 2012. Basic anthropometry measurements (weight, height, waist circumference) were obtained. Abdominal obesity and weight status was assessed according to the International Obesity Task Force criteria.

Results: The majority of the sample had a healthy body weight (60.3%), while 4.1% were underweight, 27.2% were overweight and 8.5% were obese. For boys, the highest prevalence of underweight was recorded in Epirus, normoweight on the Ionian Islands, overweight in Central Greece and Macedonia and obesity on the Ionian Islands. For girls, the highest underweight prevalence was on the Ionian Islands, normoweight in Macedonia, overweight in Central Greece and Macedonia and obesity in Crete. Abdominal obesity affected 12.9% of the sample, with the greatest prevalence among Cretan boys and Thracian girls. Additionally, residing on the Greek islands was associated with a higher prevalence of central adiposity.

Conclusion: Greek 13-year-old adolescents exhibit high obesity and abdominal obesity rates

Abbreviations: BMI, Body Mass Index; CBC, Cannot Be Calculated; CI, Confidence Interval; COB, Central Obesity; IOTF, International Obesity Task Force; NR, Not Reported; OB, Obesity; PR, Prevalence Ratio; UW, Underweight.

* Corresponding author. Department of Nutrition & Dietetics, Alexander Technological Educational Institute, Sindos PO Box 141, Thessaloniki, GR57400, Greece. Tel.: +30 2310013584.

E-mail address: maria@nutr.teithe.gr (M.G. Grammatikopoulou).

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¹ Dimitrios Poulimeneas and Maria Grammatikopoulou equally contributed to the manuscript.

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that are subjected to geographical influences. This study provides evidence to design regionally tailored interventions that aim to tackle and prevent the disease among the nine regional districts in Greece.

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1. Introduction

Early adolescence consists of a period of major metabolic, psychological and physiological adjustments. This naturally occurring, radical metabolic transition along with the increased risky behavior and reduced physical activity levels that are both associated with adolescence act synergistically to multiply the prevalence of overweight during this period of life [1,2].

According to the STRIP intervention, children who are overweight at the age of 13 years had actually begun to gain more weight than their normoweight peers by the age of two years old [3]. Many youngsters are affected by multiple components of metabolic syndrome [4], and it has been estimated that approximately 10% of overweight 13-year-old adolescents fulfill the syndrome's diagnostic criteria [5]. More than half of 13-year-old overweight boys and nearly 2/3 of girls develop into obese adults [6], whereas many suffer from body dissatisfaction [7]. Overweight, early adolescent girls have also reported a negative health-related quality of life [8].

Despite the multiple national and EU funds spent on studying obesity during the last few decades, nutritional surveillance remains inadequate in Greece, a country with a high obesity rate [9]. According to a nutrition policy meeting that took place under the wing of the Greek Ministry of Health in July 2015, the national database urgently needs to be updated with data concerning certain age groups and specific geographical regions of the country. National data collections appear limited in the capital and in major cities, and the age distribution of obesity prevalence studies is scattered [10]. Hence, childhood and adolescent obesity are among the national health priorities, according to the Ministry of Health's agenda.

Thus, the aim of the present study was to present the national and regional prevalences of underweight, overweight and obesity among 13-year-old adolescents in Greece.

2. Methods

A nationally representative sample of 4833 13-year-old Greek adolescents (50.7% boys) was derived as a nested cohort from the omitted for blind review. The sample was selected through proportionate stratified random sampling. The recruitment took place in the participants' schools. Participation in the study was voluntary, after approval was granted by the children's parents/guardians. The Directorate of Secondary Education, the Greek Ministry of Education and the omitted for blind review approved the study.

All data have been handled in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for data involving humans.

3. Anthropometry

Trained dieticians retrieved anthropometric indices during the morning hours. Anthropometry involved measurement of body weight to the nearest 0.1 kg and height to the nearest 0.1 cm using SECA 874 portable digital scales and SECA 214 portable stadiometers (SECA, Hamburg, Germany), respectively. Body mass index (BMI) was calculated as body weight divided by squared height (kg/m^2). Adolescents were categorized by BMI according to the International Obesity Task Force (IOTF) weight-status cutoffs [11,12]. In brief, underweight boys were those with a $\text{BMI} < 15.84 \text{ kg}/\text{m}^2$, overweight boys were those with a $21.91 \leq \text{BMI} < 26.84 \text{ kg}/\text{m}^2$ and obese boys were those with a $\text{BMI} \geq 26.84 \text{ kg}/\text{m}^2$. Among 13-year-old girls, underweight was defined as a $\text{BMI} < 16.26 \text{ kg}/\text{m}^2$, overweight as $22.58 \leq \text{BMI} < 27.76 \text{ kg}/\text{m}^2$ and obese as $\text{BMI} \geq 27.76 \text{ kg}/\text{m}^2$. The IOTF classification was selected for this study to provide similar overall obesity results to the WHO growth charts [13]; moreover, it is more frequently used in adolescent research [14], and it allows for better comparability with other published studies [10,15]. Waist circumference was measured according to a standardized method [16], using a common inelastic tape to the nearest 0.5 cm. Abdominal obesity was diagnosed according to the criteria set by the International Diabetes Federation for European–American children [17].

4. Statistics

The 21st version of the Statistical Package for Social Sciences (SPSS Inc., Hong Kong) was used for data analyses. Comparisons between categorical values were conducted with chi-square tests and prevalence ratios (PR), which are suitable for cross-sectional studies [18]. A P value $\leq .05$ was considered significant. A geographical map was created with GIMP 2.8.2 software for OS X, and the bubble chart was designed with Microsoft® Excel® for Mac 2011.

5. Results

In the total sample of 13-year-old adolescents, 4.1% were categorized as underweight, the majority (60.3%) were categorized as having a normal body weight and the prevalences of overweight and obesity were 27.2% and 8.5%,

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