



# Metabolic syndrome rates among adolescents of the Greek school community.

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## Introduction

Adolescent obesity constitutes a phenomenon with epidemic prevalence in a worldwide context<sup>1</sup>. The majority of the excessive body weight consequences are caused by the extensive body fat accumulation. Excess in body fat leads to chronic diseases such as type 2 diabetes mellitus, hypertension and cardiovascular disease even in early childhood and adolescence<sup>2</sup>. Thus, obesity epidemic leads to significant increase in the prevalence of the metabolic disorders that follow the excessive body weight<sup>3</sup>.

Lately, prevalence of metabolic syndrome among youngsters is reported to follow an augmentation pattern<sup>4,5</sup>. Increased rates of metabolic syndrome among adolescents represent a consequence of the obesity epidemic, leading to high risk for type 2 diabetes mellitus<sup>6</sup>.

The present study, focuses on the preliminary outcomes of a school-based intervention trial regarding the control of the metabolic syndrome among adolescents of Northern Greece.

## Methods

The aim of the study was to identify the metabolic syndrome in a sample of a school adolescent population and to thereafter record it. A total of 424 adolescents, aged  $14.10 \pm 1.78$  years were recruited. Anthropometric values were measured. All participants underwent a school-based laboratory investigation including glucose, cholesterol and triglyceride levels measurement via telematic health care devices. Finally body composition has also been determined in a school-setting for all participants.

## Results

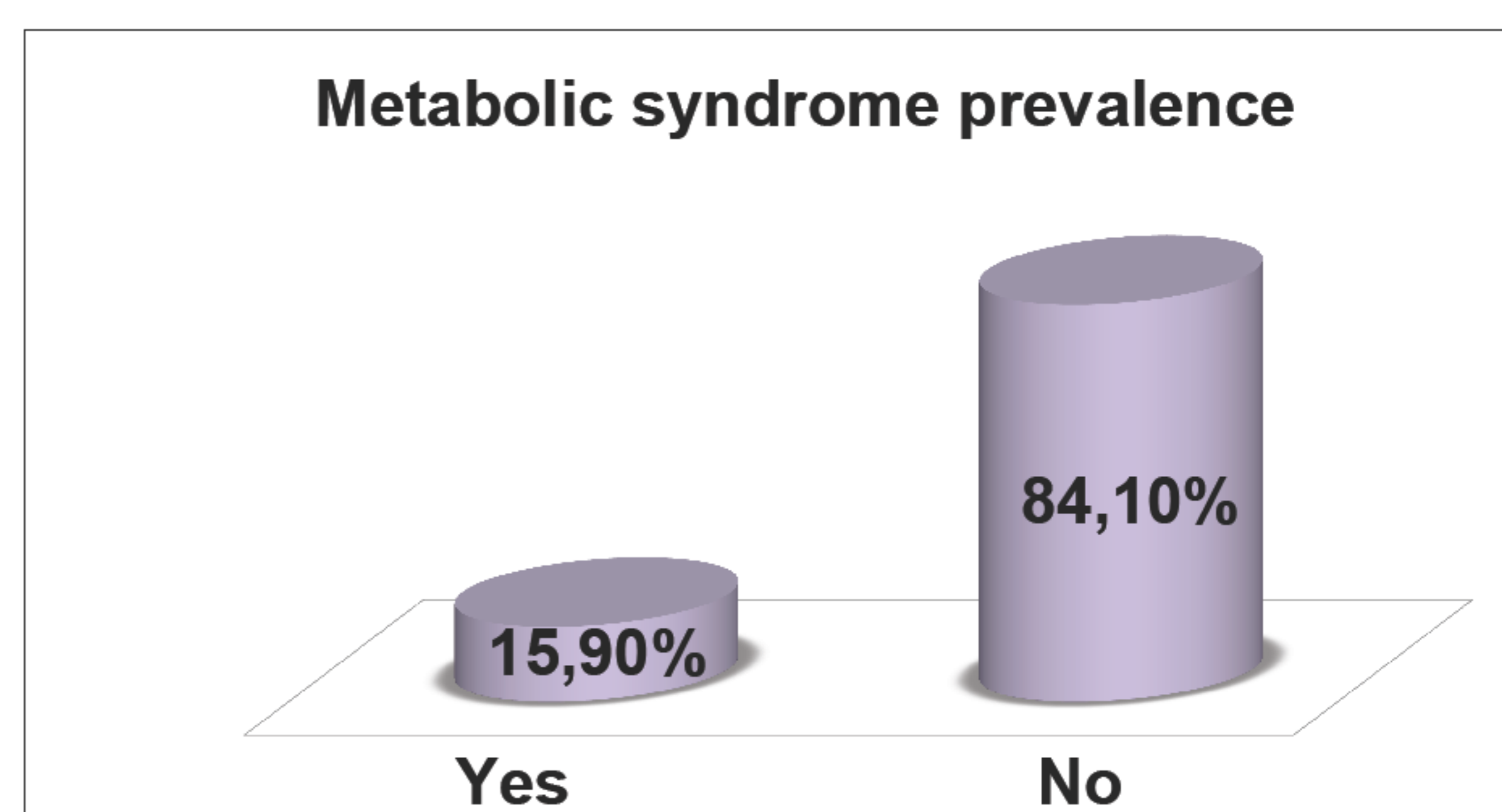
In the total sample (59% girls), body mass index was  $21.82 \pm 3.25$  kg/m<sup>2</sup> while waist circumference was  $78.78 \pm 9.29$  cm. Systolic and diastolic blood pressure were  $121.21 \pm 11.89$  mmHg and  $73.88 \pm 10.54$  mmHg, respectively. Mean cholesterol levels were  $172.42 \pm 27.48$  mg/dl. Triglycerides levels  $88.07 \pm 40.15$  mg/dl and glucose levels  $100.89 \pm 15.11$  mg/dl.

After examining the components of the metabolic syndrome in adolescents, 24.4% of the sample presented abdominal obesity (waist circumference: girls >80cm, boys >94cm). Hyperglycemia ( $\geq 100$  mg/dl) was found in 52.2% of the sample. Hypercholesterolemia ( $\geq 200$ mg/dl) was diagnosed in 15% of the total population. Elevated triglycerides ( $\geq 150$  mg/dl) was measured in 6.3% of the adolescents under investigation. Increased systolic blood pressure ( $\geq 130$  mmHg) was present in the 22% of participants, while increased diastolic blood pressure ( $\geq 85$ mmHg) was apparent in 11.7% of the sample.

Table 1. Clinical characteristics and laboratory values of patients, in relation to the presence of the metabolic syndrome

|                                 | Metabolic Syndrome |                    | p-value |
|---------------------------------|--------------------|--------------------|---------|
|                                 | Yes (15.9%)        | No (84.1%)         |         |
| Gender (M/F)                    | 4.7%/24.2%         | 95.3%/75.8%        | <0.001  |
| Age (years)                     | 14.61 $\pm$ 1.91   | 14.00 $\pm$ 1.76   | 0.014   |
| BMI (kg/m <sup>2</sup> )        | 24.97 $\pm$ 3.2    | 21.21 $\pm$ 2.90   | <0.001  |
| Waist circumference (cm)        | 89.37 $\pm$ 8.71   | 76.78 $\pm$ 7.96   | <0.001  |
| Systolic Blood Pressure (mmHg)  | 125.02 $\pm$ 12.29 | 120.29 $\pm$ 11.61 | 0.004   |
| Diastolic Blood Pressure (mmHg) | 76.33 $\pm$ 10.85  | 73.29 $\pm$ 10.42  | 0.039   |
| Cholesterol (mg/dl)             | 177.36 $\pm$ 29.43 | 171.30 $\pm$ 26.96 | 0.127   |
| Triglycerides (mg/dl)           | 98.66 $\pm$ 45.65  | 85.48 $\pm$ 38.36  | 0.032   |
| Glucose (mg/dl)                 | 103.59 $\pm$ 13.97 | 100.28 $\pm$ 15.31 | 0.117   |

Finally, after taking together all data mentioned above, almost one out of six adolescents (15.9%) presented metabolic syndrome.



## Conclusions

A significant proportion of the Greek adolescent population of North Greece fulfills the criteria of the metabolic syndrome or presents abnormal value to one of its components. In order to avoid the development of chronic diseases, implementation of prevention and intervention strategies are considered in adolescence as priority actions.

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