



ORIGINAL ARTICLE

## Waist-to-height ratio and sedentary lifestyle as predictors of metabolic syndrome in children in Ecuador

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### KEYWORDS

Metabolic syndrome;  
Children;  
Waist-to-height ratio;  
Sedentary lifestyle;  
Obesity;  
High-sensitivity  
C-reactive protein;  
Interleukin-6

### Abstract

**Objective:** To determine the predictors and prevalence of metabolic syndrome (MS) and the presence of vascular inflammation in apparently-normal children (10–15 years) of both sexes in Guayaquil, Ecuador.

**Study design and methods:** We included 395 apparently-healthy students from a middle-income school in a cross-sectional survey. Informed consent was obtained from students and parents. Anthropometric measurements including blood pressure (BP), body mass index (BMI) and waist-to-height ratio (WHtR), and blood tests were recorded. Vascular inflammation parameters were assessed. Percentiles of the different parameters were used, and MS was defined according to National Cholesterol Education Program Adult Treatment Panel III criteria (NCEP-ATPIII). Waist circumference > P 75, blood pressure > P 90, glucose > 100 mg/dl, triglycerides > 100 mg/dl, HDL < 45 mg/dl. If 3 of the 5 criteria were present, this was considered MS.

**Results:** The mean age was 12 years (186 boys, 209 girls). The overall prevalence of MS was 9.37% (6.33% in girls, 3.04% in boys). Sustained hypertension was detected in 6.6% of children and pre-hypertension in 7.1%. Obesity was found in 1.8% of subjects, and overweight in 15.2%. Triglycerides has a RR 2.34 (1.97–2.76); HOMA index has a RR 1.97(1.62–2.40); HDL cholesterol has a RR 1.84(1.58–2.13); Insulin level has a RR 1.53(1.40–1.67) and interleukin 6 has RR 1.83(1.20–2.79). Serum glucose, total cholesterol and LDL-Cholesterol had no association with the metabolic syndrome.

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HDL-Cholesterol < 45 mg/dl and triglyceride > 100 mg/dl were present in 70% of subjects with MS. The WHtR threshold  $\geq 0.5$  was 100% sensitive in both sexes (67% specificity in boys and 69% in girls). There were significant associations between the WHtR and pre-hypertension and sedentary lifestyle ( $P < 0.001$  and  $P < 0.003$  respectively). A WHtR value of  $\geq 0.50$  indicated a 2.2-fold increased risk of MS compared with normal WHtR, and normal weight.

**Conclusions:** A WHtR  $\geq 0.5$  was 100% sensitive in detecting MS in 10–15 year-old boys and girls in the normal or overweight range of the BMI. This assessment is a simple and practical tool for use in population-based studies of cardiovascular risk. When combined with pre-hypertension and a sedentary lifestyle, the WHtR is highly sensitive in predicting MS.

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## PALABRAS CLAVE

Síndrome metabólico;  
Niños;  
Índice cintura-altura;  
Vida sedentaria;  
Obesidad;  
Proteína C reactiva de alta sensibilidad;  
Interleucina 6

## Índice cintura-altura y estilo de vida sedentario como factores predictivos del síndrome metabólico en niños de Ecuador

### Resumen

**Objetivo:** Determinar los factores predictivos y la prevalencia del síndrome metabólico (SM), así como la presencia de inflamación vascular en niños aparentemente normales (10-15 años) de ambos sexos en Guayaquil, Ecuador.

**Diseño del estudio y métodos:** Incluimos en una encuesta transversal a 395 estudiantes aparentemente sanos de una escuela de renta media. Se obtuvo consentimiento informado de los estudiantes y padres. Se registraron las medidas antropométricas que incluyeron presión arterial (PA), índice de masa corporal (IMC), índice cintura-altura (ICA), y hemogramas. Se valoraron los parámetros de inflamación vascular. Se utilizaron los percentiles de los diferentes parámetros, definiéndose el SM con arreglo a los criterios del National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATPIII): valores de perímetro de cintura > 75, presión arterial > 90, glucosa > 100 mg/dl, triglicéridos > 10 mg/dl, HDL < 45 mg/dl. En caso de presentar 3 de estos 5 criterios se consideró la presencia de SM.

**Resultados:** La edad media fue de 12 años (186 chicos, 209 chicas). La presencia general de SM fue del 9,37% (el 6,33% en chicas y el 3,04% en chicos). Se detectó hipertensión sostenida en el 6,6% de los niños, y pre-hipertensión en el 7,1%. Se encontró obesidad en el 1,8% de los sujetos, y sobrepeso en el 15,2%. Los valores de RR fueron: para triglicéridos, 2,34 (1,97-2,76); índice HOMA, 1,97 (1,62-2,4); HDL colesterol, 1,84 (1,58-2,13); nivel de insulina 1,53 (1,4-1,67) e interleucina 6, 1,83 (1,2-2,79). Los valores de glucosa sérica, colesterol total y LDL-colesterol no guardaron asociación con el síndrome metabólico.

Los valores de HDL-colesterol < 45 mg/dl y triglicéridos > 100 mg/dl se encontraron en el 70% de los sujetos con SM. El límite de ICA  $\geq 0,5$  reflejó una sensibilidad del 100% en ambos sexos (67% de especificidad en chicos y del 69% en chicas). Se encontraron asociaciones significativas entre ICA y pre-hipertensión y el estilo de vida sedentario ( $p < 0,001$  y  $p < 0,003$ , respectivamente). El valor de ICA  $\geq 0,5$  indicó un incremento de 2,2 del riesgo de SM en comparación al valor normal de ICA y peso normal.

**Conclusiones:** El valor de ICA  $> 0,5$  reflejó un 100% de sensibilidad a la hora de detectar el SM en chicos y chicas de 10 a 15 años dentro del rango normal de IMC. Esta medida es una herramienta simple y práctica de utilizar para valorar el riesgo cardiovascular en estudios basados en la población. Al combinarse con la pre-hipertensión y el estilo de vida sedentario, el ICA es altamente sensible a la hora de predecir el SM.

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## Introduction

Obesity is a global public health epidemic that affects people of all ages and is one of the main components of the metabolic syndrome (MS). Detection and management of overweight and obesity in children and adolescents is important due to the high probability of obesity persisting into adulthood, with the consequent harmful effects on

cardiovascular morbidity and mortality, particularly when associated with hypertension and diabetes. Therefore, early detection of excess weight and predictors of MS, and the implementation of preventive mechanisms during childhood is crucial. Predictive factors of obesity and MS should be simple and cheap to obtain and report.

Children and adolescents with abnormally high weight are classified as overweight, obese, or severely obese, according

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