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ORIGINAL ARTICLE

Association of metabolic syndrome with low birth weight, intake of high-calorie diets and acanthosis nigricans in children and adolescents with overweight and obesity☆

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KEYWORDS
Metabolic syndrome;
Acanthosis nigricans;
Obesity;
Low birth weight;
High-calorie diet

Abstract
Objective: The theory of fetal programming suggests that low birth weight (LBW) predisposes to greater food intake and increases the chance of overweight and obesity, which are in turn associated to conditions such as metabolic syndrome (MS) and acanthosis nigricans. The study objective was to ascertain whether an association exists between MS, LBW, intake of high-calorie diets, and acanthosis nigricans in children and adolescents with overweight or obesity.

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Material and methods: A case-control was conducted on 100 children who attended the overweight and obesity outpatient clinic of the OPD Hospital Civil de Guadalajara ''Fray Antonio Alcalde''. Subjects were stratified in groups with and without MS based on the criteria of the International Diabetes Federation for children aged less than 16 years. Data on LBW, intake of high-calorie diets for 24-h dietary recalls (average 2 days a week), and acanthosis nigricans (Simone criteria) were obtained by questioning the parents. Frequencies and logistic regression were calculated using SPSS version 22.
Results: The results show that 82% of children and adolescents were obese and 18% overweight, and 73% had MS. MS was associated to LBW (OR: 4.83 [95% CI: 1.9–12.47]), high-calorie diets (OR: 136.8 [95% CI: 7.7–2434]), and acanthosis nigricans (OR: 1872 [95% CI: 112.9–31028]).
Conclusions: In children and adolescents with overweight and obesity, LBW, high-calorie diets, and acanthosis nigricans are associated to a higher probability of MS.

PALABRAS CLAVE
Síndrome metabólico;
Acantosis nigricans;
Obesidad;
Bajo peso al nacimiento;
Dieta hipercalórica

Asociación del síndrome metabólico con bajo peso al nacimiento, consumo de dietas hipercalóricas y acantosis nigricans en escolares y adolescentes con sobrepeso y obesidad

Resumen
Objetivo: La teoría de la programación fetal sostiene que el bajo peso al nacimiento (BPN) predispone a mayor ingesta alimentaria e incrementa las probabilidades de sobrepeso y obesidad, y estas a su vez de alteraciones como síndrome metabólico (SM) y acantosis nigricans. Nuestro objetivo fue estudiar la existencia de asociación entre el SM, el BPN, el consumo de dieta hipercalórica y la acantosis nigricans, en escolares y adolescentes con sobrepeso y obesidad.
Material y métodos: Se realizó un estudio de casos y control en 100 menores que acudían a la consulta de sobrepeso y obesidad del OPD Hospital Civil de Guadalajara, «Fray Antonio Alcalde»; se categorizaron con y sin SM con los criterios de la Federación Internacional de Diabetes para menores de 16 años. Se obtuvo por interrogatorio a los padres y menores, el BPN, el consumo de dietas hipercalóricas (promedio de 2 días/semana del recordatorio de 24 h) y la acantosis nigricans (criterios de Simone). Las frecuencias y la regresión logística se calcularon con SPSS versión 22.
Resultados: Los resultados muestran que el 82% de los menores presentaron obesidad, el 18% sobrepeso y el 73% SM. El SM se asoció con BPN (OR: 4,83 [IC 95%: 1,9-12,47]), dieta hipercalórica (OR: 136,8 [IC 95%: 7,7-2434]) y acantosis nigricans (OR: 1872 [IC 95%: 112,9-31028]).
Conclusiones: En escolares y adolescentes con sobrepeso y obesidad se encontró que el BPN, la dieta hipercalórica y la acantosis nigricans representan mayor probabilidad de SM.

Introduction

Low birth weight (LBW) is a determinant factor for health in adult life which, when associated to high-calorie diets, promotes accumulation of adipose tissue in the abdominal region and obesity. This leads to development of metabolic syndrome (MS), diabetes mellitus, and insulin resistance (IR).[1]

The implications of LBW are supported by the theory of ''fetal programming'', that relates malnutrition in critical periods of development, such as in intrauterine life of infants with LBW, to permanent changes in metabolism and body structure.[2]

These changes potentially increase susceptibility to obesity and cardiovascular and metabolic diseases in adulthood, and are more severe if calorie consumption in infancy is higher than the recommended daily intake (high-calorie diet).[2]

A sign of IR is acanthosis nigricans (AN), whose pathophysiology is still unknown. It is clinically characterized by hyperpigmented, verrucous skin plaques with hyperkeratosis.[3]

The most commonly accepted theory to explain development of AN is that presence of hyperinsulinism due to IR activates insulin-like growth factor-1, which stimulates keratinocytes and skin fibroblasts, thus leading to AN.[3]

In Mexico, high food intake has promoted excess weight, which is a national public health problem. The 2012 National Health Survey showed that 19.8% of boys aged 10–15 years were overweight and 18.1% were obese; in girls, the corresponding rates were 29.6% and 14.8% respectively.[4] This, combined with presence of LBW, may promote development of MS.