



ORIGINAL ARTICLE

Relationship between leptin and body mass and metabolic syndrome in an adult population[☆]

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Leptin;
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Abstract

Objective: To analyze the relationship between leptin and obesity expressed as body mass index (BMI) and certain components of the metabolic syndrome (MS) in an adult population.

Methods: The study included 103 subjects, 42 men and 61 women, aged over 30 years, clinically defined as non-diabetic but with personal or family history of cardiovascular disease. All subjects underwent fasting blood measurement of leptin, insulin, glucose, glucose after ingestion of 75 g glucose, HDL cholesterol and triglycerides, and insulin resistance (IR) and BMI were calculated. **Results:** BMI as an index of overall adiposity was strongly associated with serum leptin. BMI rose as serum leptin levels increased from the first to the third tertile; the correlation between leptin and BMI was strong, $r=0.524$ in men and $r=0.603$ in women, with high statistical significance ($p<0.001$); BMI was the best predictor of hyperleptinemia on ROC analysis, with area under the curve (AUC)=0.81 in men and 0.84 in women.

The association between leptin and obesity ($\text{BMI} \geq 30 \text{ kg/m}^2$) showed high odds ratios (OR) in both sexes (10.11 in men, 6.00 in women) on univariate regression analysis and 9.30 in men and 8.21 in women on multivariate regression analysis.

Hyperinsulinemia and IR strongly influenced hyperleptinemia. Leptin was the best predictor of IR in both sexes (AUC=0.89 in men and 0.85 in women), and IR in men (AUC=0.79) and hyperinsulinemia in women (AUC=0.78) were the best predictors of hyperleptinemia after BMI. The correlations between leptin and IR, and leptin and insulinemia, were strong in both sexes.

With regard to MS components, increased serum levels of the study variables were observed as leptin concentrations rose from the first to the third tertile (with the exception of HDL cholesterol, which decreased).

Conclusion: Elevated serum leptin, particularly in obese individuals, should be taken as a warning sign of energy imbalance, poor diet, hyperinsulinemia, insulin resistance, or changes in other metabolic risk factors that are strongly associated with cardiovascular disease and type 2 diabetes.

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PALAVRAS-CHAVE

Leptina;
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Insulinorresistência;
Síndrome metabólica

Relação entre a leptina, a massa corporal e a síndrome metabólica numa amostra da população adulta**Resumo**

Objetivo: Estudar a relação que a leptina tem com a obesidade (expressa em índice de massa corporal) e alguns componentes da síndrome metabólica (SM) numa amostra da população adulta.

População e métodos: Em 103 indivíduos, 42 homens e 61 mulheres, com idades superiores a 30 anos, clinicamente definidos como não diabéticos mas com patologia cardiovascular e/ou antecedentes familiares de doenças cardiovasculares (DCV), determinaram-se, além da leptina, a insulina, a glicémia em jejum e após ingestão de 75 g de glicose, HDL-c, triglicéridos e calcularam-se os índices de resistência à insulina (IR-HOMA) e de massa corporal (IMC).

Resultados: O IMC, tomado como índice de obesidade geral, condicionou os níveis séricos da leptina.

O IMC subiu, em ambos os sexos, à medida que os níveis séricos da leptina se elevaram do 1.º para o 3.º tercil da respetiva distribuição.

Foi muito forte a correlação leptina/IMC com $r=0,524$ nos homens e $r=0,603$ nas mulheres, significância estatística elevada.

Na previsão da hiperleptinemia, a posição cimeira foi assumida pelo IMC com AUC (*area under curve*) de 0,81 nos homens e 0,84 nas mulheres.

Ao avaliar-se a magnitude da associação da leptina, aos diferentes fatores de risco (regressão logística binária univariada) observaram-se valores muito altos de *odds ratio* (OR) para a relação leptina/IMC, em ambos os sexos (10,11 nos homens e 6,00 nas mulheres). Verificou-se mesmo (regressão logística multivariada) que a hiperleptinemia foi condicionada, em ambos os sexos, pela obesidade com OR de 9,30 nos homens e 8,1 nas mulheres, considerando $IMC \geq 30 \text{ kg/m}^2$.

- A hiperinsulinemia e a IR influenciaram profundamente a hiperleptinemia.

Na previsão da IR, a leptina surgiu, em ambos os sexos, como primeiro elemento (AUC=0,89 nos homens e 0,85 nas mulheres) e, na previsão da hiperleptinemia, vêm logo a seguir à obesidade (IMC), a IR nos homens e a hiperinsulinemia nas mulheres com AUC respetivamente de 0,79 e 0,78.

Foram fortes as correlações leptina/IR-HOMA e leptina/insulina, em ambos os sexos e enorme a influência que nos homens teve a hiperinsulinemia (OR=11,71) e a IR nas mulheres (OR=21,22).

- Relativamente aos componentes da SM:

Observou-se elevação dos respetivos níveis séricos, à medida que as concentrações da leptina subiram do 1.º para o 3.º tercil da respetiva distribuição (com exceção do HDL-c, que desceu).

Conclusão: O aumento da leptina sérica, sobretudo nos indivíduos obesos, deve constituir sinal de alerta para desequilíbrios energéticos e do *regimen* alimentar, para a existência de hiperinsulinemia, de IR, de alterações em outros fatores de risco metabólicos que têm profunda influência nas DCV e diabetes tipo 2.

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Introduction

Leptin is a protein hormone mainly produced in adipose tissue, the mass of which it regulates through its effects on food intake and energy metabolism. It is also involved in other physiological processes including reproduction; it has its own receptors that are distributed throughout the body and the mechanisms by which it acts are beginning to be understood.¹

This population-based study is in the same ambit as research under way in different countries into the relationships between insulin, insulin resistance (IR), metabolic syndrome (MS) and elevated leptin levels. However, due to

limitations in the study and in the scope of our work, certain important aspects of these issues will not be addressed here, as at present no firm conclusions can be drawn. These include the pathophysiological mechanisms that link obesity and the atherosclerotic process and hence cardiovascular disease (CVD) and MS; how the adipose tissue of general obesity leads to the development of systemic IR; the cellular and molecular mechanisms underlying insulin secretion and sensitivity; the causes of leptin resistance; and the reasons for the marked differences in leptin levels between men and women.

The aim of the present study is to examine the relationship between leptin and obesity and MS, specifically

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