



ORIGINAL ARTICLE

Biochemical and nutritional markers and antioxidant activity in metabolic syndrome[☆]



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Received 6 October 2013; accepted 7 January 2014

Available online 21 June 2014

KEYWORDS

Metabolic syndrome;
Antioxidant;
Nutrition;
Isoprostanes

Abstract

Background and objectives: (1) Nutritional assessment of the diet followed by patients with metabolic syndrome and (2) biochemical analysis of the oxidation–reduction level in patients with metabolic syndrome.

Materials and methods: A cross-sectional study was conducted in patients with metabolic syndrome in Murcia. Fifty-three patients, 33 with and 20 without (control group) metabolic syndrome, were selected. The intervention consisted of completion of a recall survey and a test to nutritionally assess dietary intake. Anthropometric and laboratory variables, including those related to antioxidant activity, were also tested.

Results: Antioxidant activity was within normal limits in both groups (1.7 ± 0.2 mmol/L in the control group and 1.8 ± 0.1 mmol/L in the metabolic syndrome group) (NS). Superoxide dismutase levels were not significantly different between the groups. Mean glutathione reductase levels (U/L) were higher in the control group when compared to patients with metabolic syndrome ($p < 0.05$). With regard to oxidative stress biomarkers, mean isoprostane levels were higher in the control group (4.9 ± 6.2 ng/mL) than in the metabolic syndrome patients (3.5 ± 3.9 ng/mL) ($p < 0.05$). Oxidized LDL values tended to be higher in metabolic syndrome patients (96 ± 23.2 U/L) when compared to the control group (86.2 ± 17.3 U/L), but differences were not significant.

Conclusions: There is a trend to a poorer nutritional and biochemical profile in patients with metabolic syndrome, who also tend to have a greater degree of oxidative stress.

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[☆] Please cite this article as: Bernabé García J, Zafrilla Rentero P, Mulero Cánovas J, Gómez Jara P, Leal Hernández M, Abellán Alemán J. Marcadores bioquímicos, nutricionales y actividad antioxidante en el síndrome metabólico. Endocrinol Nutr. 2014;61:302–308.

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PALABRAS CLAVE

Síndrome metabólico;
Antioxidante;
Nutrición;
Isoprostanos

Marcadores bioquímicos, nutricionales y actividad antioxidante en el síndrome metabólico**Resumen**

Antecedentes y objetivos: 1) Valorar nutricionalmente la dieta seguida por los pacientes con síndrome metabólico, y 2) analizar bioquímicamente el nivel de oxidación-reducción en los pacientes con síndrome metabólico.

Material y método: Se trata de un estudio transversal realizado a pacientes con síndrome metabólico de la Región de Murcia. Se seleccionaron 53 individuos, 33 con síndrome metabólico y 20 sin él (grupo control). La intervención realizada consistió en la cumplimentación de una encuesta recordatorio y un test para valorar nutricionalmente la ingesta dietética, además de la determinación de variables antropométricas y analíticas que incluyen variables relacionadas con la actividad antioxidante.

Resultados: La actividad antioxidante en ambos grupos analizados está dentro de los límites normales ($1,7 \pm 0,2$ mmol/l en el grupo control y $1,8 \pm 0,1$ mmol/l en el grupo con síndrome metabólico; ns). La enzima superóxido dismutasa no presenta diferencias significativas entre ambos grupos. Los valores medios de glutatión reductasa (U/l) son superiores en el grupo control que en los pacientes con SM ($p < 0,05$). Respecto a los biomarcadores de estrés oxidativo, los valores medios de isoprostanos son superiores en el grupo control ($4,9 \pm 6,2$ ng/ml) que en los pacientes con SM ($3,5 \pm 3,9$ ng/ml; $p < 0,05$). Los valores de LDL oxidadas tienden a ser superiores en los enfermos con SM ($96 \pm 23,2$ U/l) que en el grupo control ($86,2 \pm 17,3$ U/l), no observándose diferencias significativas.

Conclusiones: Existe una tendencia a un peor perfil nutricional y bioquímico de los pacientes que presentan síndrome metabólico. También tienden a presentar un mayor grado de estrés oxidativo.

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Introduction

Metabolic syndrome (MS) encompasses a number of risk factors including central obesity, dyslipidemia, abnormal glucose metabolism and high blood pressure, associated to insulin resistance, which increases risk of diabetes mellitus, heart disease (myocardial infarction and heart failure), peripheral artery disease, stroke, and kidney disease.^{1,2} Resistance to the peripheral action of insulin is the common pathogenetic link and plays a central role in development, progression, and destabilization of atheroma plaque by different pathogenetic pathways. Thus, glucose metabolism changes usually coexist in a same individual with classical risk factors (high blood pressure, dyslipidemia, overweight-obesity) and cardiovascular risk markers (inflammation, altered fibrinolysis).^{3,4} This series of changes form the so-called MS, and are important because of their relationship with cardiovascular risk.⁵⁻⁷

Prevalence of MS varies depending on factors such as sex and age, and ranges from 15% to 40%.^{1,6} There are several criteria to diagnose MS. The most widely known is the Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III),⁸ according to which three or more of the following criteria should be met: elevated abdominal circumference (>102 cm in males and >88 cm in females), triglycerides >150 mg/dL, low HDL (<40 mg/dL in males and <50 mg/dL in females), blood pressure $>130/85$ mmHg, and blood glucose >110 mg/dL, including diabetes mellitus. Other factors such as inflammation, hyperuricemia, smoking, sedentary lifestyle, age, polycystic ovary syndrome, and microalbuminuria were also considered.

The criteria issued by the Adult Treatment Panel III defined a type of patient with high cardiovascular risk and are most commonly used, although no universal agreement exists in this regard. Because of the evident association of MS with cardiovascular disease, it should be prevented by promoting healthy habits since childhood, stressing the importance of a healthy diet and regular exercise.⁸⁻¹³

It was considered interesting to undertake a study analyzing the biochemical and nutritional characteristics of patients with MS. Therefore, objectives of this study included: (1) to nutritionally assess the diet taken by patients with MS and (2) to biochemically analyze the oxidation-reduction level in patients with MS.

Patients and methods

This was a cross-sectional study conducted on patients with MS in the region of Murcia (Spain).

The study sample was randomly selected using representative sampling. An opportunistic search system was used to enroll patients who attended a health center on demand or on an appointment, met the inclusion criteria, and agreed to participate. The sample consisted of 53 patients of both sexes (29 female and 24 male patients) with ages ranging from 50 to 65 years. Patients with MS ($n=33$) met three of the requirements established by the Adult Treatment Panel III,⁸ and the control group ($n=20$) consisted of healthy subjects of the same age range. Information about the study was provided to each patient, and all participants gave their written informed consent. Subjects with any infectious disease at the time of the study; use of multivitamin preparations; severe kidney, liver, or systemic disease; abnormal

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