Med Clin (Barc). 2017;149(4):141–146

MEDICINA CLINICA

www.elsevier.es/medicinaclinica

Original article

Multiple chemical sensitivity: Genotypic characterization, nutritional status and quality of life in 52 patients☆

Viviana Loria-Kohen[a,*], Helena Marcos-Pasero[a], Rocío de la Iglesia[a], Elena Aguilar-Aguilar[a], Isabel Espinosa-Salinas[a], Jesús Herranz[a], Ana Ramírez de Molina[a], Guillermo Reglero[a,b]

[a] IMDEA-Food, Campus de Excelencia Internacional (CEI) UAM + CSIC, Madrid, Spain
[b] Departamento de Producción y Caracterización de Nuevos Alimentos, Instituto de Investigación en Ciencias de la Alimentación (CIAL), Campus de Excelencia Internacional (CEI) UAM + CSIC, Madrid, Spain

ARTICLE INFO

Article history:
Received 22 August 2016
Accepted 17 January 2017
Available online 10 August 2017

Keywords:
Multiple chemical sensitivity
Malnutrition
Genetic polymorphisms
Quality of life

ABSTRACT

Background and objectives: Multiple chemical sensitivity (MCS) is a chronic, multisystem syndrome of unknown etiology. The aim of the present study was to describe the nutritional status and quality of life of patients suffering from MCS, as well as to identify potential polymorphisms associated with this illness.
Patients and methods: A cross-sectional, descriptive study was performed on patients with a diagnosis of MCS. Data on anthropometric and body composition variables, hand muscle strength and quality of life were collected. The selection of single nucleotide polymorphisms (SNPs) was based on genes previously associated with MCS and genes involved in inflammatory and oxidative stress pathways.
Results: A total of 52 patients (93.2% female), with a mean age of 50.9 (10.3) years were included in the study. Among them, based on their BMI, 48% had an inadequate nutritional status (17% were underweight and 32% were overweight or obese). Thirty percent of patients had a low muscle mass for their age, 84% had muscle strength below the tenth percentile, and 51.8% had a high fat mass percentage. Regarding quality of life, all median scores were lower than those of other illnesses assessed for every subscale assessed. Statistically significant differences between patient cases and controls were found with respect to rs1801133 (MTHFR), rs174546 (FADS1) and rs1801282 (PPARγ) polymorphisms.
Conclusion: A high percentage of patients had a poor nutritional status, low muscle strength and decreased muscle mass. These facts exacerbate the already-lower quality of life of these patients. Specific genetic polymorphisms associated with the syndrome or its pathogenesis was not identified.

Sensibilidad química múltiple: caracterización genotípica, estado nutricional y calidad de vida de 52 pacientes

Palabras clave:
Sensibilidad química múltiple
Malnutrición
Polimorfismos genéticos
Calidad de vida

RESUMEN

Antecedentes y objetivos: La sensibilidad química múltiple (SQM) es un síndrome multisistémico y crónico, de etiología desconocida. El objetivo de este estudio fue describir el estado nutricional y la calidad de vida, así como identificar posibles polimorfismos asociados al síndrome o a su patogenia.
Pacientes y métodos: Estudio epidemiológico, descriptivo y transversal en pacientes con diagnóstico de SQM. Se recogieron datos antropométricos, composición corporal, fuerza muscular y calidad de vida. La selección de *single nucleotide polymorphisms* (SNP, «polimorfismos de un solo nucleótido») se centró en genes asociados previamente a la SQM y genes que participan en rutas de estrés oxidativo e inflamación.
Resultados: Se incluyeron 52 pacientes (93,2% del sexo femenino), con una edad media de 50,9 (10,3) años. Respecto a su estado nutricional (IMC), un 48% estaba fuera de rangos de normalidad (17% desnutrición y

☆ Please cite this article as: Loria-Kohen V, Marcos-Pasero H, de la Iglesia R, Aguilar-Aguilar E, Espinosa-Salinas I, Herranz J, et al. Sensibilidad química múltiple: caracterización genotípica, estado nutricional y calidad de vida de 52 pacientes. Med Clin (Barc). 2017;149:141–146.

* Corresponding author.
E-mail address: viviana.loria@imdea.org (V. Loria-Kohen).

32% sobrepeso y obesidad). Un 30% presentó masa muscular por debajo de la referencia para la edad, un 84% una fuerza muscular inferior al percentil 10 y un 51,8% un porcentaje de masa grasa elevado. Respecto a la calidad de vida, las puntuaciones medias estuvieron por debajo de las de otras enfermedades en todas las subescalas evaluadas. Se observaron diferencias significativas en las frecuencias encontradas entre casos y controles para los SNP rs1801133 (MTHFR), rs174546 (FADS1) y rs1801282 (PPARγ).
Conclusión: Un elevado porcentaje de pacientes presentó un estado nutricional anormal con masa y fuerza muscular disminuidas, lo que reduce la calidad de vida de estos pacientes, ya mermada por la sintomatología. No se identificaron polimorfismos genéticos específicos asociados al síndrome o a su patogenia.

Introduction

Multiple chemical sensitivity (MCS) is the most commonly used term for describing a complex syndrome consisting of a set of symptoms associated with a wide variety of environmental agents and components. Such reactions occur with exposure to levels commonly tolerated by most individuals.[1,2]

Currently, the detected cases of MCS have a large interindividual variability, both in symptomatology and in severity, arousing great interest in the scientific community.[3] The prevalence of MCS in the general population has not been well defined, although some authors report percentages of 0.1–5%.[4] In Spain, there is still no data available to know the rate.

The available scientific studies describe a variety of factors that can lead to MCS (from immunological or inflammatory variables to oxidative stress, hyperhistaminemia, psychological factors or changes in the metabolism of xenobiotics). However, the pathophysiological basis is still unknown.[5–8] It has also been associated with genetic factors, such as the particular variants in the CYP2D6, NAT2, PON1, MTHFR and CCK2R genes.[9–12]

There is an association with other syndromes, such as chronic fatigue syndrome (30–50%) and fibromyalgia (30–50%),[13] which increases the occurrence of clinical symptoms. This makes suppose that there might be etiopathological and pathophysiological mechanisms common in these diseases.[3] In recent years the concept of central sensitization (CS) has been defined as an amplified response of the central nervous system caused by injury or stimulation of a peripheral tissue. This process triggers a series of structural, functional and molecular changes, which, clinically, are characterized by excessive sensitivity to a series of stimuli, generating effects such as chronic pain, sensitivity to chemicals, light, etc. SC may be the common mechanism underlying central sensitization syndromes, including FM and MCS.[14]

Regarding the nutritional status of these patients, there are very few studies addressing this issue. However, it is presumed that the high response and the symptomatology caused by certain foods may have consequences on it, damaging the evolution of the syndrome.

The existing gaps about the causes, origin and pathophysiology of MCS have made it difficult to develop a scientific clinical basis for diagnosis and treatment. For this reason, in the Consensus on MCS carried out by the Ministry of Health, Social Services and Equality, in combination with various societies and groups of experts, recommend the opening and maintenance of lines of research on this disease.[1]

The aim of this study was to describe the nutritional status and quality of life and to identify potential polymorphisms associated with the pathogenesis of the disease in order to progress in understanding the disease, its consequences and the potential therapeutic targets to improve the health and quality of life of these patients.

Patients and methodology

The study was conducted at the Nutrition and Clinical Trials Unit of the Madrid Institute for Advanced Studies in Food (IMDEA-Food) during the month of September 2015. The inclusion criteria were men and women over 18 years old with an exclusive medical diagnosis of MCS or associated with CFS for at least one year, and whose clinical records could be delivered in written format for verification. The criterion used in the diagnosis was not always specified. However, some of the patients indicated the use of the Quick Environmental Exposure and Sensitivity Inventory (QEESI) for the determination. They were also required to have an adequate understanding of the study to be performed and they should show their interest in voluntary participation through written informed consent. All patients who, because of the severity of their symptoms, were not able to travel to the Institute's facilities for the study evaluation visit were excluded.

The selection was made by the Chronic Fatigue Syndrome and Multiple Chemical Sensitivity Syndrome Association of the Community of Madrid. The personnel in charge invited their partners to participate (n = 120) and screened those who met the inclusion criteria.

During the visit, health, socio-health data, anthropometric parameters, and 300 μl of peripheral whole blood were collected for the determination of genetic parameters. In addition, within the months prior to the evaluation visit the volunteers received a data collection notebook with detailed instructions to complete it, with the option to be helped by their family members or friends.

BF511 Body Composition Monitor (Omron Healthcare Co., Ltd., Kyoto, Japan) was used to determine body weight and composition. For size, a stadiometer (Biological Medical Technology S. L, Barcelona, Spain) and, a Seca 201 inelastic tape measure (Quirumed, Valencia, Spain) was used for waist and arm circumference. For dynamometry we used a hand dynamometer (Collin, Gebrüder Martin, Germany), and skinfolds were taken with a plicometer (Holtain, Crymych, UK).

For assessing the quality of life, we used the SF-36 questionnaire, validated in the Spanish population.[15–17] In order to define the degrees of disease, an adaptation of the QEESI exposure and sensitivity questionnaire was used.[2] The medical records were conclusive when establishing the diagnosis of CFS or FM, whereas cases of electrosensitivity were mostly self-reported by the volunteers themselves.

In the genetic analysis, we selected 64 single nucleotide polymorphisms (SNPs) belonging to 53 genes involved in oxidative stress, inflammation, lipid metabolism and polymorphism pathways that were previously associated with the presence of MCS, CFS and FM. The rates were compared to those of a healthy population with similar features (sex and age), belonging to the Genetics and Food Platform of IMDEA-Food Institute. Genomic DNA was obtained using a commercial QIAamp DNA Blood Mini Kit (QIAGEN,