SHORT COMMUNICATION

Dietary patterns and metabolic disorders in multiple sclerosis

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ABSTRACT

Diet plays an important part in the etiopathogenesis of many neurological diseases, and it can exacerbate symptoms by causing metabolic problems. The results of studies on the impact of diet in the progression of Multiple Sclerosis (MS) are equivocal, and dietary recommendations for MS patients are currently a work in progress. The goal of this study was to look at the Dietary Patterns (DPs) of MS patients and see whether there were any links between them and metabolic issues. There were 330 patients in the trial, with an average age of 41.9 years and 10.8 years. Data on diet, lifestyle, and health were gathered using a survey questionnaire. A major component analysis was used to find the DPs (PCA). Traditional Polish, Prudent, and Fast Food and Convenience Food were designated as the three DPs. An analysis of the odds ratios adjusted for age, gender, smoking, and education revealed that patients who followed the Traditional Polish and Fast Food and Convenience Food DPs were more likely to have abdominal obesity and low HDL cholesterol levels. Adherence to the Prudent DP, on the other hand, was not linked to any metabolic disease. The findings of this investigation indicated that an unhealthy diet is linked to the presence of metabolic risk factors in MS patients. There's also a pressing need to educate MS patients about healthy eating, because making the right dietary changes can help them improve their metabolic profile and clinical results.

INTRODUCTION

Multiple Sclerosis (MS) is a central nervous system inflammatory-demyelinating disease with an unclear aetiology. The presence of diffuse foci of demyelination, especially in the white matter of the brain, most typically periventricularly, is a defining feature of the condition. About 85 percent of cases have Relapsing-Remitting MS (RRMS), which develops into the Secondary Progressive Form (SPMS) with a consistent development of disability after a set amount of time (which varies depending on the patient). The primary progressive type (PPMS) is marked by a gradual increase in impairment from the time the disease first manifests itself, with few overlapping relapses. It's a rarer form of MS that's usually identified considerably later than RRMS and has a distinct symptomatology as well as a Magnetic Distinctive Imaging (MDI) [1]. A developing spastic paresis of the lower limbs and alterations in MRI primarily related to the spinal cord are the most prominent neurological signs. PPMS is believed to account for 10-20 percent of all MS patients. MS often strikes people between the ages of 20 and 40, and it is one of the most common causes of neurological disability among young people. MS affects more than 2.8 million people worldwide, with roughly 1.0 million of them living in Europe. According to recent epidemiological study, the prevalence of MS in Poland is around 120 instances per 100,000 individuals, resulting in a total of 45,000-50,000 patients. An autoimmune process, in combination with exogenic and environmental variables, genetic predispositions, and the patient's lifestyle, is the major mechanism in the pathogenesis of MS.

Multiple risk factors may play a role in the first autoimmune response that contributes to the development of MS. There is substantial evidence that MS risk is linked to Epstein-Barr virus infection, smoking and cigarette smoke exposure, poor vitamin D levels, and obesity during adolescence. Obesity has also been linked to MS in children and adolescents, particularly among teenage girls [2]. The findings of studies on the role of diet in MS treatment are equivocal, and no consensus has been formed on dietary advice for MS patients. In a long-term study of patients with MS who were diagnosed before the age of 18 years, each 10% increase in fat consumption increased the risk of remission by 56%; a 10% increase in saturated fat consumption more than tripled the risk; and, conversely, each additional serving of vegetables in the patient's diet reduced the risk by 50%.As a result, some meta-analyses have concluded that there is insufficient evidence to determine if vitamin D supplementation, antioxidants, polyunsaturated fatty acids, or other dietary therapies have a substantial impact on MS patients' health outcomes. However, the authors of these meta-analyses emphasised that the evidence gathered to date is little and of poor quality, making it difficult to draw definitive conclusions. Furthermore, because the effect of individual nutrients is sometimes too tiny to establish a clear link between them and health indicators, such assessments may result in an underestimating of their impact. According to the findings of research that looked at the diet in a more complete way, a proper diet can enhance the health of MS patients, as well as ease some symptoms and help with treatment. An inappropriate diet, on the other hand, can have a negative impact on health outcomes, disease progression, and the patient's neurological condition, mostly due to increased inflammation. However, the DPs of MS patients have not been extensively studied or reported in the topic literature around the world, and no such research has been undertaken in Poland to our knowledge. Obesity, dyslipidemia, metabolic syndrome, hypertension, and cardiovascular disease are common comorbidities in MS patients (CVDs). These comorbidities are linked to greater MS activity, as well as disability, impaired cognitive functioning, worse quality of life, increased health-care utilization, and a higher mortality rate. As a result, by changing the onset of metabolic disorders, the patient's diet may alter the course of the disease and intensify its symptoms. The goal of this study was to look at the dietary patterns (DPs) of MS patients and see whether there were any links between them and the metabolic abnormalities they had [3].

MATERIAL AND METHODS

Data and Sample collection

A total of 335 MS patients took part in the trial, which took place between October 2020 and May 2021. Patients from neurological clinics in the Swietokrzyskie Voivodeship in Poland ('n=218) were selected as subjects. Other participants (n=117) were recruited online from the Polish Association for Multiple Sclerosis (PAMS) and the Neuro Pozytywni online forum. The study required participants to be between the ages of 18 and 65 and have a neurologist-confirmed diagnosis of relapsing-remitting, secondary progressive, or primary progressive MS. This multi-part food frequency questionnaire was created for a Polish population ranging in age from 15 to 65 years old. KomPAN has been proved to be a trustworthy technique with acceptable to very good reproducibility in research conducted on both healthy and unhealthy participants [4]. The KomPAN questionnaire can also be recommended for use with data-driven DPs and diet quality scores to define regular diets, according to research.

Diet

Data on the frequency of consumption of 31 food groups was gathered. Never (0 times/day); 1-3 times a month (0.06 times/day); once a week (0.14

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times/day); a few times a week (0.5 times/day); once a day (1.0 time/day); or a few times a day (2.0 times/day) were the options given to the responders [5]. Following that, the overall Diet Quality Index (DQI) was produced in line with the questionnaire manual to allow for a combined interpretation of food consumption with a potentially helpful or potentially negative influence on health.

Lifestyle

Smoking, physical activity, screen time, and sleep time were all evaluated as part of a respondent's lifestyle. 'Yes' or 'no' replies were allowed based on past and current smoking practises. To define their degree of physical activity at work or school, respondents chose one of three categories: low-over 70% of sedentary time; moderate-about 50% sedentary time and 50% active time; and high-about 70% of active time or high-intensity physical labour [6].

Statistical analysis

For categorical variables, the data were reported as percentages of the sample, and for continuous variables with a normal distribution, the means (X) and Standard Deviations (SDs). The Kolmogorov-Smirnov test and the Shapiro-Wilk test were used to ensure that the variables were normal before statistical analysis [7]. The Pearson's chi-squared test for categorical variables and the t-test for continuous variables with a normal distribution were used to verify differences between the groups. A Principal Component Analysis (PCA) with a normalised varimax value was used to derive the Dietary Patterns (DPs). The Kaiser-Meyer-Olkin (KMO) coefficient of 0.721 was used to verify the adequacy of the analysis and the number of components, and the statistical significance was evaluated using Bartlett's test (p0.0001). In the PCA, a total of 31 diet-related variables were considered.

RESULTS

The average age of the participants in the study was 41.9 years. Women made up nearly three-quarters of the participants (76.6%), and nearly half of them lived in big cities. Over three-quarters of the participants said they were in a comfortable financial situation, and more than half said their household situation was average. The majority of the participants had completed their higher education and were employed full-time. Relapsing-remitting MS was diagnosed in almost 86 percent of the individuals. Women had a higher prevalence of this kind of MS than males, whereas men had a higher prevalence of primary progressive MS (PPMS) (p=0.05). The prevalence of a particular form of MS and the gender distribution were both consistent with the epidemiological statistics. Over 56% of individuals said their health had gotten worse as a result of MS, while only 7.9% said it had gotten better. Other chronic diseases were reported by women more frequently than by men (25.1% *vs.* 10.6%). The majority of the participants ate three or four meals per day, but just a few of them ate at the same time every day [8]. Nearly a quarter of the participants said they were on a diet, the most common of which was a low-energy diet. In the previous month, nearly three-quarters of the participants used dietary supplements, with more than half taking vitamin D.

DISCUSSION

This is the only study that we are aware of that has sought to identify DPs and analyse their relationships with metabolic risk factors in MS patients in the Polish community. Traditional Polish DPs were identified in this study as having a high consumption of animal goods such as meat, cold cuts and sausages, butter, milk, cheese, fried meals, a considerable amount of sweets, white bread, and potatoes [9]. Higher adherence to this DP by study participants was linked to a higher risk of abdominal obesity and poor HDL cholesterol levels, as well as the existence of any two metabolic diseases in the non-adjusted model. It was also linked to a higher risk of abdominal obesity and an insufficient HDL cholesterol level. Such DPs frequently result in an excess of fat in the diet, particularly Saturated Fatty Acids (SFAs), which can alter gene expression, produce gut microbiota dysbiosis, cause systemic inflammation, and contribute to the development of metabolic disorders and chronic diseases. Other studies have linked a high SFA content in the diet of MS patients to an elevated risk, a poor clinical course, and poor metabolic health.

Furthermore, a higher baseline total and LDL-cholesterol, as well as a propensity for greater triglyceride concentrations, were linked to a worse outcome on the Expanded Disability Status Scale (EDSS). The methods through which hyperlipidemia may contribute to MS development are still being investigated. Nuclear receptors and transcription factors that regulate gene expression and inflammatory pathways may be involved in these mechanisms, according to the study. In the general population, a high diet of carbs from foods like sweets, white bread, and potatoes leads to abdominal obesity, triglyceridemia, type 2 diabetes, and the difficulties that come with it. Abdominal obesity has been linked to higher impairment in MS patients. Little is known regarding the role of carbohydrates in the diet of MS patients and their impact on metabolic risk factors in this population. According to the research, a patient's sugar intake is linked to an elevated insulin concentration in the blood, which can contribute to inflammation and exacerbate MS symptoms. The study's primary flaw was its cross-sectional design [10]. As a result, determining the temporal relationship between the outcome and the exposure was impossible. Furthermore, the data on metabolic risk factors in patients who took part in the trial online was declared, which implies it could have been erroneous in many situations. The risk variables for some of the participants may not have been identified yet. The high prevalence of abdominal obesity in this group of individuals shows that, as a result of this abdominal obesity, the prevalence of additional metabolic illnesses is likely to rise with time.

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