Original Article

Food Insecurity in Patients with Multiple Sclerosis and Its Association with Anthropometric Measurements

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A B S T R A C T

Background: Multiple sclerosis (MS) is the most common neurological disorder which affect the capabilities of sensory-motor and the ability of producing and preparing food in patients. This study aimed to determine the prevalence of food insecurity in patients with MS and its association with body mass index (BMI) and demographic parameters.
Methods: In this cross-sectional study, 139 patients who were registered in the Council of Patients with MS in Shiraz, southern Iran were randomly selected (including 118 women and 21 men with an average age of 26.5 years). The state of food insecurity of these patients was assessed by using a questionnaire of Household Food Security Status. Height, weight, waist circumference, hip circumference and arm circumference were measured based on the standard instructions and waist to hip ratio and body mass index was also calculated.
Results: The prevalence of food insecurity and the level of food security in the patients were 69.8% and 30.2%, respectively. A significant difference was observed in the waist to hip circumference ratio that was higher in the food insecurity group than the food security group. Assessing anthropometric data with food security score showed a significant inverse relationship between arm circumference and food security score, although the association was not strong.
Conclusion: According to the findings of this study, food insecurity has a high prevalence in patients with MS. Significant inverse relationship between arm circumference and food security score observed in these patients indicates to poor nutritional status of them.

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Introduction

Food and nutrition are the basic needs of human which lies in the category of food security. Food security is defined as access of people at all times to

enough food for active and healthy life that includes (i) Access to adequate nutritious food, and (ii) The ability and confidence to acquire acceptable foods in a socially acceptable way. Food insecurity compare to food security is associated with hunger, pain and anxiety due to absence of enough food intake or lack of symptoms (1, 2). Age, education of household head, the economic situation, not having a steady job, single parent, ethnicity, an increase of household size and eating habits were shown as factors affecting food insecurity (3, 4).

Food insecurity is common in both developing and developed countries affecting 6 to 73 percent of population (5). Food insecurity is considered as a complex problem (6) because is associated with low and excessive intake of micronutrients (7). Some studies have shown that food insecurity are associated with overweight and obesity (8, 9). Being overweight and having waist circumference≥88 cm were demonstrated to be higher in food insecure females than food secure women (9, 10); in other words, malnutrition can be caused by food insecurity (11, 12). A positive correlation was seen between the frequency of monthly consumption of bread, pasta, potatoes, beans and eggs and the household food insecurity (13).

Multiple sclerosis (MS) is a chronic inflammatory autoimmune and degenerative diseases of the central nervous system (14) that is associated with the destruction of the blood-brain barrier, peripheral vascular inflammation, axonal damage and demyelination of the central nervous system (15). Nowadays, genetic factors, sex, smoking, having a viral infection (EBV: Epestein-Barr virus), vitamin D deficiency and obesity are the important risk factors in these patients (16).

Consumption of unpasteurized milk, animal fat, meat and potatoes were considered as nutritional factors that affect the severity of demyelination of nerve cells in regions with high prevalence of MS (17). The incidence and prevalence rate of MS in Iran are 0.68-1.9 and 5.3-74.28 per 100,000 population, respectively and the prevalence was found to be higher in women (18). MS affect the sensory-motor, perceptual, cognitive and psycho-social ability and in many other patients' for functional areas (19), such as the initial preparation of food and even the complete

food preparation that have an impact on the person's food-insecurity. The prevalence of food insecurity has not been assessed yet in patients with MS in an Iranian society, so this study aimed to determine the prevalence of food insecurity in patients with MS, as well as its association with anthropometric measurements.

Materials and Methods

This cross-sectional study was undertaken in 2015 on 139 patients with MS who were registered in the Council of patients with MS in Shiraz, southern Iran. The subjects were enrolled based on convenience sampling. Food security in the patients was assessed using Household Food Security questionnaire of the US Department of Agriculture (USDA). This questionnaire was completed by interviewing participants and studied the household food security situation in the past 12 months. This questionnaire consisted 2 parts: (i) The first part was about household and (ii) The second part was about children that was completed for the households who had a child under the age of 18 years.

This questionnaire was assessed by the USDA in 1995 and was introduced as a valid questionnaire for epidemiologic studies. It should be noted that 18-item questionnaire was assessed in a study conducted by Rafiee *et al.* in Isfahani households and was validated in 2009 (20). The validity of this questionnaire was assessed in another study conducted in Shirazi households (4). Rating of 18-item USDA household food security status questionnaire was performed based on methods of Bickel *et al.*'s (2). This means that the options "often true", "sometimes true", "almost every month", "some months" and "yes" got positive score=1 and the responses such as "incorrect ", "only 1-2 months" and "No" got negative score=zero (Table 1).

The height and weight of patients were measured by gauge strip with a precision of 0.1 cm and scale of Seca with a precision of 0.1 Kg with light clothing and without shoes, respectively. Waist circumference, hip and arm circumference were measured using non-elastic tapes with precision of 0.1 cm based on the standard guidelines by a trained person (21). The distance around the smallest area below the rib cage

Table 1: The Prevalence of food insecurity		
Variable	**Number**	**Percent**
Food security	42	23.2
Mild food insecurity	25	18.0
Moderate food insecurity	29	20.9
Severe food insecurity	43	30.9
	N=139	N=100

and above belly button and the hip circumference at the largest area of the buttocks were considered to be measured. Then, the body mass index (BMI) was calculated using the formula of weight in kilograms divided by the square of the height in meters and waist to hip ratio was calculated too. Patients' demographic information including age and sex were recorded.

After collecting required data, SPSS software (version 19, Chicago, IL, USA) was used for statistical analysis. T test was used for the comparison of quantitative variables in two groups of food security and food insecurity, including the average age, sex, weight, waist circumference, hip circumference, arm circumference and BMI. Pearson correlation test was used to study the relationship between variables of weight, BMI, waist, hip and arm circumferences and waist-to-hip ratio with food security score. Results were reported as mean±SD and $p \leq 0.05$ was considered statistically significant.

Results

The average age of study population with MS (118 women and 21 men), was 26.5±2.1 years. Mean values of anthropometric parameters of participants were as follows: Weight: 63±1.2 Kg; BMI: 23.5±4.3 Kg/m²; waist circumference: 86.1±1.1 Cm; hip circumference: 97.2±1 Cm; arm circumference: 26.2±3.7 Cm and waist-to-hip ratio of 0.87±0.06. The prevalence of food insecurity in these patients was 69.8% which consisted of 18% food insecurity without hunger, 20.9% food insecurity with hunger and 30.9% food insecurity with severe hunger (Table 1).

According to anthropometric measurements, a significant difference was observed only in waist-to-hip circumference ratio that was higher in food insecurity group than the food security group (p=0.02), while there were no significant differences in other anthropometric measurements between two groups (Table 2). The correlation between anthropometric parameters and food security score showed a significant inverse relationship between arm circumference and food security score (p=0.045) (Table 3).

Discussion

Percent of food-insecure patients with MS was 69.8% in this study and the percent of food-insecurity without hunger, with moderate hunger and severe hunger were 18%, 20.9%, 30.9%, respectively. As mentioned before, based on our knowledge this is the first study conducted on patients with MS. However, similar studies have been done for other diseases. As Daneshi *et al.* reported 69.17% for the prevalence of food insecurity in the study conducted in newly diagnosed patients with cancer of the upper digestive tract (22). Silverman *et al.* stated the 47.4% for the prevalence of food insecurity in controlled diabetic patients (23).

In another study, the prevalence of food insecurity in newly diagnosed diabetic patients was 66.7% (24). Therefore, it seems that food insecurity is highly prevalent in patients with MS, as its statistics is equal to malignant diseases such as gastrointestinal cancer. Moreover, many studies have shown that food insecurity is associated with overweight and obesity (5, 7, 8, 25). Therefore, the prevalence of having large waist circumference (≥88 cm) was higher in food insecure women than food secure women (9, 10). A positive correlation was noted between the frequency of monthly consumption of bread, pasta, potatoes, beans and eggs and the household food insecurity (13).

Table 2: Comparison of the average of anthropometric measurements in patients based on food security

Group	Food security N=42	Food insecurity N=97	*p*-value
Weight (kg)	63.20±9.80	62.90±13.20	0.893
BMI (Kg/m²)	23.40±3.60	23.60±4.60	0.754
Waist circumference	85.20±10.30	86.5±12.40	0.536
Hip circumference	98.60±7.70	96.60±11.08	0.298
Arm circumference	26.10±3.02	26.20±3.90	0.864
Waist-to-hip ratio	0.86±0.07	0.88±0.07	0.020

BMI: Body mass index

Table 3: The correlation between the anthropometric parameters and food security score

Variable	Food security score	
	Pearson coefficient	*p*-value
BMI (Kg/m²)	-0.078	0.36
Waist circumference	-0.076	0.37
Waist-to-hip ratio	-0.118	0.16
Arm circumference	-0.170	0.045

BMI: Body mass index

Hence, the studies have shown that obesity and overweight and high consumption of potatoes may increase the risk of developing MS disease (16, 17). Therefore, these factors denote to the high prevalence of food insecurity in patients with MS. This study showed that the increase in food insecurity (food security score) is associated with reduction in the circumference of the arm. Food insecurity is a complex problem of nutrition; as it is associated with malnutrition, hunger, and in other hand with overweight and obesity (6). In a study conducted by Campbell *et al.*, malnutrition was considered as a strong result of food insecurity (11). Also, the policy makers are advised to focus on eliminating food insecurity to reduce malnutrition in communities (12).

However, the measurement of arm circumference was considered as a useful indicator to determine the acute malnutrition in its initial stage which indicates the patients' lean body mass status (26-28). Therefore, a lower arm circumference in patients with MS, may represent the onset of malnutrition caused by food insecurity. Since many factors influence the problem of food insecurity such as ethnicity, age, education of household head, the economic situation, job loss, not having a steady job, single parent, an increase of household size, families' with children under 5 years old, and so on, considering the effect of each of these factors to access the different sources of food, and good selection of food is important for justifying the result of food insecurity and its effects (4, 29).

According to statistics of 2013, the number of food-insecure people was estimated to be 707 million and it is predicted that it will rise 23% reaching 868 million by 2023 (30), therefore it is most important to consider the debilitating and costly diseases to slow down and reduce these figures. As mentioned above, percent of food-insecure patients with MS is significantly high and it is most important to consider the nutritional status of these patients due to the fact that food insecurity will be increased in Iranian society. So, in future studies it is better to record the patients' food intake at the same time for the appropriate assessment to provide a nutritional future policy.

The findings of the present study demonstrated a high prevalence of food insecurity in patients with MS. Therefore, the food insecurity may be associated with an increased risk of disease incidence. Cause and effect cannot be accurately identified since this was a cross-sectional study and case-control or prospective studies should be conducted to improve the association between food insecurity, MS disease and other indices. Significant and weak inverse relationship between arm circumference and food security score observed in these patients indicates to poor nutritional status of the patients.

Conflict of Interest

None declared.

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