Journal of Home Economics
Volume 31, Number (1), 2021
http://homeEcon.menofia.edu.eg

Journal of Home Economics
ISSN 2735-5934

Assessment of nutritional status in patients with Multiple Sclerosis

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Abstract

The present study was designed to determine the nutritional status and anthropometric measurements of patients with multiple sclerosis (MS) .Ninety-one of new diagnosed multiple sclerosis patients had thirty-four males and fifty-seven females from El Demerdash and El Kasr El- Einy hospital, in Cairo. The nutritional status of patients was determined by a 3-day and 24-hour dietary record and a food frequency questionnaire. Body composition was analyzed by body mass index was calculated. The Nutrient Data Base (DRI) program was used to evaluate the energy and nutrient intakes of patients and compared with Dietary Reference Intakes recommendations. Blood samples were collected and C.B.C lipid profiles, thyroid hormanes, renal and liver function were analyzed. and Using statistical analysis of the data analysis was conducted test (T.test) to test the statistical significance of the differences between males and females been making comparisons between two gender have been using the level of statistical significance when ($P < 0.05$) . The results showed that females with multiple sclerosis suffer from overweight, while males were at a normal weight. The results showed that there were significant differences between males and females in the daily intake of energy, protein, carbohydrates and fats, so the rate of males' consumption of macronutrients was higher than that of females. On the other hand there were non-significant differences ($p \leq 0.05$) between gender in T3, TSH and VTdB. there were non-significant differences ($p \leq 0.05$) between gender in HDL, LDL and T.G. so results showed that patients with multiple sclerosis (MS) suffer from Hyperlipidemia and Hypothyroidism.

In conclusion, this study points to a possible correlation between nutritional status and MS. in both male and female the administration of

balance nutrients can lower the side effects of MS and improve the health status
Keywords: Multiple Sclerosis, C.B.C, macro and micro nutrients, patients

Introduction

Multiple sclerosis (MS) is a chronic, inflammatory, and autoimmune disease of the central nervous system (CNS), leading to widespread focal degradation of the myelin sheath, variable axonal and neuronal injury, and disabilities in young adults, mostly women. The disease is characterized by disseminated and heterogeneous perivascular inflammatory processes at the blood–brain barrier (BBB), with involvement of auto reactive T cells, B lymphocytes, macrophages, and microglial cells against brain and spinal cord white matter **(McFarland and Martin, 2007 ; Constantinescu *et al.*, 2011 ; Kutzelnigg and Lassmann, 2014).**

Multiple sclerosis (MS) is a potentially disabling disease of the brain and spinal cord (central nervous system). In MS the immune system attacks the protective sheath (myelin) that covers nerve fibers and causes communication problems between your brain and the rest of your body. Eventually, the disease can cause permanent damage or deterioration of the nerves **(Baecher-Allan *et al*., 2018).**

Dietary habits that diminish MS symptoms may be considered as complementary treatments of MS. Likewise, further knowledge on the effects of possible harmful dietary habits could help prevent chronic states of inflammation and avoid worsening of the disease **(Riccio and Rossano, 2013).**

Nutritional intervention with anti-inflammatory food and dietary supplements can alleviate possible side effects of immune-modulatory drugs and the symptoms of chronic fatigue syndrome and thus favor patient wellness **(Riccio and Rossano, 2015).** All polyphenols which are present in vegetables, cereals, legumes, spices, herbs, fruits, wine, fruit juices, tea, and coffee—have anti-inflammatory, immune-modulatory, anti-angiogenic, and antiviral properties and stimulate the catabolic pathways **(Gupta *et al*., 2014; Wang *et al*., 2014).**

Vitamin D has immune-modulatory roles and represents the most promising dietary molecule for the treatment of chronic inflammatory diseases such as MS **(Smolders *et al*., 2008 ; Pierrot-Deseilligny, 2009 ; Cantorna, 2012 ; Ascherio *et al*., 2014).**

The 2008 WHO report found that exposure to sunlight and diet affected the geographical distribution of MS, suggesting that vitamin D

may play a role in MS risk **(WHO, 2008)**. Some studies have found that low vitamin D levels may increase the risk of developing MS, and several studies have suggested that patients with MS with low levels of vitamin D are at increased risk of relapses, new lesions, and disability **(Solomon, 2011).** In the Nurses' Health Study, women who took additional vitamin D supplements had a 40% lower risk of MS **(Munger *et al.*, 2004).** Analyzing data from the Nurses' Health Study II, researchers recently found that higher maternal consumption of milk and vitamin D was associated with a lower risk of offspring developing MS **(Mirzaei *et al.*, 2011).** However, in another study, no association was found between dietary intake of vitamin D during adolescence and the risk of developing MS **(Munger *et al.*, 2011).**

Red meat contains more iron heme than white meat. The iron is easily nitrosylated and this facilitates the formation of endogenous nitroso-compounds (NOCs) **(Joosen *et al.*, 2010).** Supplementation with Calcium-containing compounds maintains the structure and stability of myelin, may be protect from MS in future and reduced relapses in multiple sclerosis patient. On the other hand, multiple sclerosis patients have low bone mineral density due to Glucocorticoid use and reduced mobility during the disease progression **(Hearn and Silber, 2010).** In light of the beneficial and detrimental properties of iron in MS, and pantothenic acid is required for the regulation of iron, sufficient iron levels are required for re-myelination and repair whilst avoiding excess that might contribute to damage **(Stephenson *et al.*, 2014).**

2. Subjects and Methods

2.1. Subjects

This study was carried out on ninety-one male and female participants of multiple sclerosis from El Demerdash and El Kasr El-Einy hospital, in Cairo. Aged from 18 to 55 years old to participate in the study.

The instrument of this study consisted of a structured interviewing questionnaire. This consists of three parts: The first is to collect data about the diet of the studied multiple sclerosis cases. The second is to collect data about health history of the studied multiple sclerosis cases. The third is anthropometric measurements and laboratory investigation. Finally food intake by using 24 - hr. Recall method.

All subjects gave their informed consent for inclusion before they participated and the study was approved by the Ethics Committee of-June 2019

2.2.Methods

2.2.1.Daily Dietary Date:

24 hour recall: Food intake assessed for each patient through collection of 3 days food record for energy and nutrients intake assessment. The 3 days dietary recall included (a dialysis day, a weekend day, and a non-dialysis day) as suggested by the guidelines **(KDOQI, 2000) & (Fouque *et al.*, 2007).**

2.2.2Anthropometric measurements

- Post-dialysis edema-free weight (dry weight): was measured within 10-20 minutes after dialysis session, the body weight was measured in light clothing and without shoes.
- Height was measured by measuring tape.
- BMI was calculated as the ratio of end dialysis body weight in kg. divided by the square of the height in meters (kg/m2). **(Din-Mohammadi and Pour memari, 2003).**

2.2.4Biochemical measurements

Some biochemical parameters (serum glucose, total cholesterol, triglyceride, high density lipoprotein (HDL-C), low density lipoprotein (LDL-C), total protein, albumin, total calcium, magnesium, vitamin B12, vitamin D) of the patients were analyzed. The biochemical parameters were determined by using conventional autoanalysers. The nutritional behavior of the patients was determined by a food frequency questionnaire.

2.2.2. Laboratorv investigation

- Complete Blood Count (CBC): according to **Dacie and Lewis, (1998)**.
- Liver function : according to **Yound, (1975).**
- Renal function: Creatinine: according to **Schirmeister, (1964)**.
- Triiodothyronine (T3) and tetraiodothyronine (T4) were determines according to **Patrono and Peskar (1987).**
- Triglycerides (TG), high density lipoprotein (HDL) and low density lipoprotein (LDL) were determined according to **Fossati and Principe (1982) and Richmond *et al.*, (1974)**.

2.3. Statistical Analysis and Results:

IBM personal computer equipped with a programme of **SPSS, (1998)** package was used to analyse the data.

3. Result and discussion :

The Data of table (1) indicates that mean Age was 32.0882±7.56year for males and 30.5614±8.550 year for females so there was non-significant differences ($p \leq 0.05$) between gender. As for mean weight it was higher in males than females. The mean values were 75.6471±15.4 and 68.3772±13.51 kg respectively. So there was significant differences ($p \leq 0.05$) between gender. On the other hand mean height was 175.0588±7.55cm for males and 160.3509±8.13cm for females. So there was significant differences ($p \leq 0.05$) between gender.

As for mean BMI in females was higher than males with mean values 26.2446±4.88 and 24.6165±4.60, respectively. there was non-significant differences between gender.

Table(1): Anthropometric measurements of multiple sclerosispatients (N=91).

Anthropometric measurements	Males (n=34) Mean±SD	Females (n=57) Mean±SD	P.value
Age	32.0882±7.56	30.5614±8.550	0.392
Weight	75.6471±15.41	68.3772±13.51	0.02*
Height	175.0588±7.55	160.3509±8.13	0.00**
BMI	24.6165±4.60	26.2446±4.88	0.12

C.B.C. parameters results of patients with MS were shown in **Table 2**.Data presented could be observed that here were significant ($p \leq 0.05$) increase in hemo., PCV, RBCs and MCV for males 13.3088, 40.9559 and 4.9265), respectively. As compared to females which were11.8163, 37.5168 and 4.4864 , respectively. On the other hand there were non- significant differences ($p \leq 0.05$) between males and females in MCV, MCH, MCHC, RDWCV, Platelet and TLC. whereas the mean values for males were 81.0265, 27.1206, 32.5029, 13.8912, 275.0588 and 6.5441, respectively and means for females were 79.2488, 26.5389, 33.1332, 13.8684, 293.6316 and 6.5139, respectively.

Table (2) : (C.B.C) of the multiple sclerosis patients (N=91).

BiochemicaL Parameters	Males (n=34) Mean±SD	Females (n=57) Mean±SD	P.value
Hemo.	13.3088±1.70	11.8163±.97	0.000
PCV	40.9559±4.183	37.5168±3.54	0.000
RBCs	4.9265±.489	4.4864±.40	0.000
MCV	81.0265±12.89	79.2488±16.46	0.592
MCH	27.1206±2.21	26.5389±2.27	0.237
MCHC	32.5029±1.97	33.1332±8.34	0.666
RDWCV	13.8912±1.21	13.8684±1.67	0.954
Platelet	275.0588±69.0	293.6316±71.39	0.227
TLC	6.5441±1.82	6.5139±1.86	0.940

Table (3) indicates that the mean ALT was 36.6176±18.91771 for males and 27.2281±15.76 for females. So there were significant differences ($p \leq 0.05$) between gender. On the other hand, there was non-significant differences ($p \leq 0.05$) between gender in AST and creatinine

with mean values 24.058, and 0.90 , respectively for males and mean values for females were 22.7035 and 0.89 respectively.

Table(3): renal and liver function of the multiple sclerosis patients (N=91).

Parameters	Males (n=34) Mean±SD	Females (n=57) Mean±SD	P.value
T3	2.7903±.69364	3.2696±1.42772	0.071
T4	1.6471±2.28441	4.1618±5.25450	0.010
TSH	1.9538±.95090	2.1475±.82329	0.308
VTdB	25.5909±11.62165	26.4989±10.33797	0.700
HDL	50.9941±13.59162	48.7702±13.66867	0.454
LDL	140.2882±20.88733	134.2298±16.72495	0.132
T.G	116.0000±21.63401	116.4123±23.02912	0.933

In **Table (4)**, The results showed that there were non-significant differences ($p \leq 0.05$) between gender in T3, TSH and VTdB with mean values 2.7903, 1.9538 and 25.5909, respectively for males and 3.2696, 2.1475 and 26.4989, respectively for females. Also The results showed that the mean value of T4 of males was significantly ($p \leq 0.05$) lower than females, which were 1.6471 and 4.1618l, respectively. At the same table, The results showed that the lipid profile for MS and found that there were non-significant differences ($p \leq 0.05$) between gender in HDL, LDL and T.G with mean values 50.9941, 140.2882 and 116, respectively for males ; 48.7702,134.2298 and 116.4123, respectively for females.

Tale(4): Some biochemical parameters of the multiple sclerosispatients (N=91).

Parameters	Males (n=34) Mean±SD	Females (n=57) Mean±SD	P.value
ALT	36.6176±18.91771	27.2281±15.76	0.013
AST	24.0588±7.86608	22.7035±9.49	0.485
Creatin	.9000±.11521	.8912±.1484	0.768

In **table (5)** results indicated that mean energy in take was 1951.8824±536.13402 kcal (88.7%) of (RDA) and 1650. 8070 ± 735.62482Kcal (67.8) of (RDA) for males and females, respectively. So

there was significant differences (p≤0.05) between males and females . Also, the results showed that the mean value of total Protein of males was significantly higher than females, which were 76.88gm (155.67%) of (RDA) and 61.19 gm (32.3%) of (RDA), respectively. And showed a significant difference (p≤0.05). It could be noticed that there were non-significant differences (p≤0.05) between males and females in fat.A, Fat.B and total fat. It could be noticed that the mean value of carbohydrate of males was significantly higher than females, which were 264.25 and 216.34 gm, respectively. And showed a significant difference (p≤0.05). Also, the results showed non-significant differences (p≤0.05) between males and females in fiber but there was significantly increased in cholesterol for males when compared with females with mean values 415.9794±329.21042 and 196.9912±139. 78983, respectively.

Table(5): Dietary energy and macronutrient intakes of the multiple sclerosispatients (N=91).

Macro nutrients	Males (n=34) Mean±SD	Females (n=57) Mean±SD	P. value
Cal.	1951.8824±536.13402	1650.8070±735.62482	0.041*
RDA Cal. %	88.7176±24.37486	67.8088±56.73373	0.045*
Pro. A	40.1294±25.73488	30.3351±14.73994	0.023*
Pro. P	36.7618±14.91666	30.8544±17.30697	0.101
T. pro.	76.8829±27.04458	61.1912±25.40870	0.007*
RDA T pro.%	155.6765±55.62398	124.9789±142.32825	0.233
Fat A	35.3588±19.62350	32.3000±19.49218	0.472
Fat P	28.9029±15.63821	28.0404±20.19590	0.831
T fat	64.5412±19.21898	60.3281±29.65445	0.461
CHO	264.2588±90.37666	216.3474±113.42203	0.039*
Fiber	16.0500±9.20047	14.3614±12.42154	0.494
Cholesterol	415.9794±329.21042	196.9912±139.78983	0.000**

Table (6) showed that the mean minerals intake for males and females compared to (DRI). The mean calcium intake and phosphorus were higher for males than females , as the values for males were 648.7±872.76 mg (78.7%) of DRI and 1309.0971±659.10 mg (156.07%) of DRI for calcium and phosphorus respectively, while the values for males were 597.81±557.378 mg (71.5%) of DRI and 1025.18±475mg (127.88%) of DRI for calcium and phosphorus

respectively. There was non-significant difference between males and females for calcium (P<0.05). On the other hand, results indicated that there were significant difference (P<0.05) between males and females for total iron with mean values 16.5 mg for males and 13.37 mg for females. The results also showed that males got more than their iron needs by10% of DRI, while females got more than their need by 38% of DRI. Concerning sodium, as shown the mean value of sodium of males was significantly higher (p≤0.05) than females, which were 3038 and 2316.07 µg/dl, respectively. Results also showed that males got more than their sodium needs by 437% of DRI, while females got more than their need by 531% of DRI. At the same table, data showed that the mean vitamins intake for males and females compared to (DRI). Concerning vit.D and vit.B12, as shown non-significant between males and females for vit.D and vit.B12.

Table(6): Evaluation of dietary micronutrient intakes of the multiple sclerosis patients by Dietary Reference Intake (DRI).

Micro nutrients	Males (n=34) Mean±SD	Females (n=57) Mean±SD	P.value
Minerals			
Calcium	648.7±872.76	597.8123±557.37889	0.735
RDA Calcium %	78.7±109.6	71.5579±69.12247	0.701
Phosphor	1309.0971±659.10	1025.1842±475.62165	0.200
RDA Phosphor%	156.0794±81.92	127.8842±108.05585	0.193
IronA	6.3382±4.793	4.6509±3.57786	0.590
IronB	10.2235±4.323	8.7211±4.63880	0.129
T. iron	16.5559±6.194	13.3702±5.59997	0.013*
RDA.T. Iron %	110.4000±41.30727	138.2895±61.65215	0.022*
Sodium	3038.0059±2137.06320	2316.0772±921.10617	0.028*
RDA sodium%	537.0118±228.91037	531.7070±340.08542	0.936
Vitamins			
VitD	4.2500±5.76443	3.6386±4.75518	0.585
RDA Vit. D%	74.7706±100.62638	58.0474±77.59562	0.377
VitB12	3.3265±3.39423	2.4877±2.33927	0.167
RDA.VitB12 %	166.3824±169.72299	173.8456±316.14199	0.899

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Journal of Home Economics, Volume 31, Number (1), 2021

تقييم الحالة الغذائية لمرضي التصلب المتعدد

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الملخص العربى

تم إجراء هذا البحث لتقييم الحالة الغذائية والقياسات البشرية لمرضى التصلب المتعدد (MS). فأجريت هذه الدراسة على 91 مريضاً (34 رجلاً ، 57 سيدة) تم تشخيصهم بمرض التصلب العصبي المتعدد الذين تقدموا إلى مستشفى الدمرداش والقصر العيني بالقاهرة. تم تحديد الحالة الغذائية للمرضى من خلال استرجاع المتناول اليومي من الغذاء من سجل غذائي لمدة 3 أيام و 24 ساعة واستبيان تكرار الطعام. وتم حساب مؤشر كتلة الجسم واستخدام برنامج قاعدة بيانات المغذيات (DRI) لتقييم المأخوذ اليومي من الطاقة والمغذيات للمرضى ومقارنتها بالتوصيات الغذائية. حيث اجرية الدراسة في شهر يونيو 2019 حتي شهر اغسطس 2019 وتم تجميع عينات الدم وعمل تحاليل صورة دم كاملة وقياس هرمونات الغدة الدرقية ووظائف كلا من الكلى والكبد. وباستخدام التحليل الإحصائي لتحليل البيانات تم إجراء اختبار (T.test) لاختبار الدلالة الإحصائية للفروق بين الذكور والإناث وقد تم عمل مقارنات بين الجنسين باستخدام مستوى الدلالة الإحصائية عند ($P <0.05$). وأظهرت النتائج أن الإناث المصابين بمرض التصلب العصبي المتعدد يعانون من زيادة الوزن ، بينما كان وزن الذكور في المستوي الطبيعي. أظهرت النتائج وجود فروق ذات دلالة إحصائية بين الذكور والإناث في المأخوذ اليومي من الطاقة والبروتينات والكربوهيدرات والدهون ، لذلك كان معدل استهلاك الذكور من المغذيات الكبري أعلى من معدل استهلاك الإناث. كما اظهرت النتائج أنه لايوجد فروق معنوية بين الذكور والاناث بالنسبة لدهون الدم وهرمونات الغدة الدرقية كما أوضحت النتائج أن مرضي التصلب المتعدد يعانون من خمول الغدة الدرقية وارتفاع دهون الدم.

الكلمات الافتتاحية: التصلب المتعدد ، صورة الدم ، المغذيات الكبري والصغرى. المقايس الجسمية – المرضي