

Serum Iron and Ferritin in Patients with Multiple Sclerosis

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Article information	Abstract
<p>Article history: Received: 17 Dec 2011 Accepted: 16 Feb 2012 Available online: 5 Nov 2012 ZJRMS 2013; 15(4): 39-42</p> <p>Keywords: Multiple sclerosis Iron Ferritin</p> <p>*Corresponding author at: Department of Neurology, Neurology Research Center, Kerman University of Medical Sciences, Iran. E-mail: fpp_farhad@yahoo.com</p>	<p>Background: Multiple sclerosis (MS) is one of the most frequent and debilitating disease of the nervous system. Some recent studies show the possible role for iron and ferritin in the course of MS. The aim of this study was to evaluate the level of serum iron and ferritin in patients with MS and comparison of them with control group.</p> <p>Materials and Methods: In this descriptive study, serum iron and ferritin were determined in 30 patients with MS and compared with 30 healthy persons, which were matched in terms of age and gender. Data were analyzed with statistical descriptive methods and <i>t</i>-test.</p> <p>Results: In this study, 30 patients were evaluated. The mean age of both groups was 35.2. Mean serum iron in patients group was 85.16 ± 38.38, and in control group was 91.73 ± 27.89. Mean serum ferritin in patients group was 132.20 ± 80.71 and in control group was 147.40 ± 75.02. There was no significant relationship between serum iron and ferritin in both groups, and also there was no relationship between serum iron and ferritin with age and sex and the type of disease.</p> <p>Conclusion: This study did not show any difference between serum iron and ferritin in patients with multiple sclerosis and control group.</p> <p>Copyright © 2013 Zahedan University of Medical Sciences. All rights reserved.</p>

Introduction

Multiple sclerosis (MS) is the most common brain demyelinating disease and regarding to greater involvement of young people, its chronic nature, and its severe and lasting effects, it is considered as the most important disease of the brain and nervous system [1]. The majority of patients suffer from various complications such as visual, sensory, motor, and balance disturbances, after years [2]. Despite years of familiarity with this disease, yet there is no consensus about its underlying causes. Infectious agents, hormonal factors, genetic factors, and autoimmune factors are just a part of the proposed theories in the pathogenesis of this disease [3, 4].

Some recent studies suggest the role of minerals, such as iron, copper, and zinc in the development and the course of the disease. It is long been known that iron is an essential ion for cerebral oxygen transport system, ion transport, and production of brain neurotransmitters [5]. However, *in vitro* investigations have been shown that excessive iron can produce free radical and damage nerve cells [6]. It is also known that iron is essential for the synthesis of brain myelin [7].

Further studies have also shown the presence of transferrin receptors on endothelial cells of the brain vasculature, which are the main way of iron effects [8]. Despite these findings which emphasis on the role of iron in the central nervous system, there are controversies in serum iron and ferritin levels of patients in different studies. For example, some case-control studies in Italy

and United States represented an increase and another study in Italy showed low levels of these substances [9-11]. Even, in contrast with the above presented findings, the results of researches published in Italy, England, and Greece showed no difference in iron and ferritin levels between patients and healthy people [5, 12, 13]. Given the contradictory results of the studies and lack of a single opinion, this research is conducted to assess the levels of serum iron and ferritin in multiple sclerosis patients and to compare them with control group in Rafsanjan city

Materials and Methods

This study is a descriptive one which used case-control method in multiple sclerosis patients who have been filed in Speciality Centers of Ali Ibn Abi Talib (AS) hospital in Rafsanjan. The disease has been confirmed by the MS Committee of Medical Sciences University through the findings of brain magnetic resonance imaging, evoked potentials, and cerebrospinal fluid analysis based on McDonald criteria [14]. The sampling of patients was performed through simple probability method. Pregnant and breastfeeding patients and those taking medications other than beta-interferon were excluded from the study.

In addition, the patients who had relapsed during the last three months and underwent corticosteroid therapy, or had another disease history, especially gastrointestinal and hematologic diseases, or consumed iron compounds or nutritional supplements or another drug (except beta-

interferon compounds) were also excluded from the study. None of the patients had a vegetarian diet. The sample size was calculated by ratio formula and in total 30 patients were enrolled. Meanwhile, for comparison, 30 persons referred to emergency due to limb closed trauma who were similar to patients in terms of age, gender, and economic and social status, and did not have any history of disease and did not use supplementary diet were chosen as control group. Rafsanjan university ethics committee had approved this study. Iron and ferritin were measured via colorimetric method and ELISA, respectively [15]. The obtained results together with demographic information were registered in a questionnaire and analyzed with SPSS-17 software and descriptive statistical (number, percent, mean), and analytical statistical (comparison, mean, and t-test) methods, with a 95 percent confidence.

Results

Thirty patients were assessed in this study, 4 of them were men and the rest were women. Mean age of men and women were 38.5 and 34.69 years, respectively. The age range of men was 32-43 years and of women was 18-47 years. In terms of MS type, 70% were relapsing-remitting, 20% secondary-progressive, 6.7% chronic-progressive, and the rest were primary-progressive. There was not a significant difference in serum iron and ferritin levels between patients and control group (Table 1). In addition, any significant statistical difference was seen in serum iron and ferritin levels, in terms of age, gender, and disease type (Tables 2 & 3).

Discussion

Multiple sclerosis is one of the most common diseases of the brain and nerves [16]. The cause of the disease is not yet known completely and various pathological and pathophysiological studies toward its cause are continuing [4]. Many recent studies have focused on the role of minerals in the pathogenesis and the course of the disease [5, 9, 12]. The effect of iron on the disease can be mentioned. No significant difference was observed between the patients group and the control group in terms of serum and ferritin levels, in this study (Table 1). Similar to our results, in 2005, Visconti in Italy conducted his study on 12 patients who had their first attack of the disease and did not observe any alterations in serum iron level of patients, neither in acute phase nor in 6 months follow-up [12]. Rieder et al. in their case-control study in England did not observe a significant difference in serum

iron level between patients and the control group, which was like our results [4]. Sfagos et al. in 2005 in Greece [13] and Abo-Krysha [17] also showed in their studies that serum iron level of patients compared to the control group had no significant difference, but serum transferrin level was higher which suggested iron dysfunction in these patients. Unlike our study and all the above studies which indicate no change in serum iron levels in MS patients, some studies were published that showed abnormal serum levels of this ion. Forte in his research on 60 patients, observed that serum iron level of the patients was higher compared to the control group [9]. Alimonti and Johnson et al. obtained also similar results [10, 11]. LeVine et al. in 1999, studied cerebrospinal fluid iron and ferritin levels in MS patients and showed an increase in ferritin level [18]. Exley also showed in his study that urinal excretion of iron in MS patients was higher than the control group [19]. Sena et al. showed in their study that treatment led to ferritin level increment in patients [20]. No significant difference was seen between age, gender, and disease type in terms of serum and ferritin levels (Tables 3 and 4). These findings are similar to many studies performed up to now [5, 12, 13, 17]. But some other researchers have shown that some factors related to iron such as transferrin may have a relationship with the type and severity of the disease [21]. That how is the impact of iron and ferritin on MS disease course or pathogenesis still remained to investigate. The researches had shown that the highest level of cerebral iron exists in oligodendrocytes which ferritin bounds to their extracellular surface. Since oligodendrocytes main role is to produce myelin and the myelin sheath of neurons are damaged in this disease, probably an imbalance of iron may lead to brain tissue inflammation and eventually to MS disease [17-22]. Haacke et al. showed that iron level is higher than normal in white matter, as well as in basal ganglia and thalamus. This iron increment may underlie the chronic failure of cerebrospinal fluid venous drainage during the disease course and in this way causes the appearance of disease symptoms [23]. Another research in Czech Republic showed that not only the iron deposition is high in basal ganglia but also the more iron is deposited the more symptoms are severe [24]. The number of women was higher than men in this study. Although, the disease is more frequently seen in women, but this great difference (86.7% women) was accidental and just was due to higher participation of women in this study. This fact is a limitation for the research, since the higher presence of women may affect the results. In addition, it was better to evaluate the association of these factors with the disease severity.

Table 1. Total serum iron and ferritin in two groups

Variable	MS Group		Control Group		p-Value
	Mean±SD	CI	Mean±SD	CI 95%	
Iron	38.38±85.16	10.77-23.90	27.89±91.37	23.94-10.81	0.4
Ferritin	80.71±132.20	55.47-25.07	75.02±147.40	55.47-25.07	0.1

Table 2. Serum iron and ferritin in different groups according to age

Age(yare)	Iron of MS Group		Iron of Control Group		p-Value	Ferritin of MS Group		Ferritin of Control Group		p-Value
	Frequency	Mean±SD	Frequency	Mean±SD		Frequency	Mean±SD	Frequency	Mean±SD	
<50	8	91.25±41.60	8	104.63±18.84	0.4	8	118.25±110.27	8	143.25±90.01	0.6
50-60	16	70.62±34.98	16	85.62±29.59	0.2	16	21.25±38.63	16	156.88±80.41	0.1
>60	6	83.11±24.28	6	90.83±31.66	0.1	6	180.00±113.32	6	127.67±33.45	0.3

Table 2. Serum iron and ferritin in different groups according to MS type

MS	Iron				Ferritin			
	Frequency	Mean±SD	CI 95%		Frequency	Mean±SD	CI 95%	
			Low	Up			Low	Up
R-R	21	90.85±39.19	73.01	108.70	21	135.33±89.86	94.42	176.23
P-P	1	30.00±0	0	0	1	32.00±0	0	0
S-P	6	79.66±28.85	49.38	109.94	6	129.50±54.45	72.35	186.64
R-P	2	69.50±58.68	-457.80	596.80	2	157.50±31.81	-575.40	-860.40

At all, the results of the study show no significant association between serum iron and ferritin levels in MS disease. Although the findings of this study is not sufficient to obtain a general conclusion about the effect of iron on the course of this disease, but strengthen the results of previous studies regarding the lack of change in serum iron and ferritin levels in MS patients. However, this finding does not deny the effect of iron in the disease course and only shows that iron and ferritin blood indices are probably not good measures for evaluating the association of iron and ferritin with MS disease. Regarding to the above findings, we suggest

complementary studies be performed in other areas as well as in other body tissues such as cerebrospinal fluid.

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Conflict of Interest

The authors declare no conflict of interest.

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