

## A concentration of serum selenium in multiple sclerosis patients compare to healthy subject in Tehran

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### ABSTRACT

Multiple sclerosis (MS) is an inflammatory demyelinating disease which the exact etiology is still are far to be clear. Reasons for this autoimmune disease are unknown origin. The aim of present study was to evaluate serum levels of selenium in patient with MS compare to healthy subjects. A total of 46 subjects were enrolled in the study, Sera of 23 MS cases and 23 healthy normal cohorts as control group were obtained. Atomic absorption spectrophotometer was employed for estimating serum selenium level. Serum selenium levels were significantly lower in MS than in control cohorts ( $60.87 \pm 13$  compared with  $85.74 \pm 12$ , P-value  $< 0.0001$ ). Serum selenium levels may thus be a marker of MS; the decreasing levels of serum selenium may be host defense strategies of body.

**Keywords:** Multiple sclerosis; Selenium; Atomic absorption spectrophotometer; Serum.

### INTRODUCTION

Multiple sclerosis (MS) is considered as an autoimmune disease; the reason of this progressive demyelinating pathology is still not completely understood [1, 2]. A series of biochemical changes characterize in MS as with the other neurodegenerations. Diverse extent neuronal functions affect these changes. Such the changes can be pointed out: great attention has been given to oxidative/nitrosative stress [3]. A series of biochemical changes are in common with other neurodegenerations such as Alzheimer's and Parkinson's diseases. At molecular point of view, biochemical changes affect on neuronal functions [4].

One of these biochemical changes is the neuronal imbalance in reactive oxygen species (ROS) and reactive nitrogen species (RNS) [5,6]. ROS are a number of reactive molecules and free radicals derived from molecular oxygen. ROS are as byproducts of during the mitochondrial electron transport of aerobic respiration. Also oxidoreductase enzymes generate these molecules.

Similarly to ROS, RNS are products of normal cellular metabolism. ROS and RNS can be either harmful or beneficial to living systems

[7]. The deleterious role of these species cause potential biological damage, oxidative stress and nitrosative stress [8].

As antioxidant, selenium can scavenge ROS and RNS. Selenium is a trace element in small amounts in the body. It combined with vitamin E and plays a role as an antioxidant. Antioxidants can be eliminated damaging particles in the body like free radicals, ROS and RNS; they neutralize free radicals. These damaging species may contribute to aging, heart disease and cancer. Antioxidants can help to prevent some of the damage of ROS and RNS. Consistent with role antioxidant of selenium in the body, immune system requests it to perform correctly.

Low levels of selenium may cause a number of conditions example some types of cancer. These properties of selenium may suggest that selenium deficiency is associated with an increased probability of developing MS [9]. The aim of the present study was to investigate prospectively the serum level of selenium in patient with MS and compare it with healthy subjects.

## MATERIALS AND METHODS

### Measurement of serum selenium levels

A total of 46 subjects were included in this study: 23 MS positive patients (9 males and 14 females with mean age of 33  $\pm$  standard deviation of 11 years) and 23 healthy (8 males and 15 females with mean age 35 $\pm$  standard deviation of 12years).

Samples were recruited from the Firoozgar hospital in Tehran. All patients were informed about the study and written consent was signed by the patients and control group. Serum samples were obtained in the morning after 12-hours overnight fast. With the purpose of coagulate serum samples; vials were stored at room temperature (20-28°C). Often in 20-30 minutes clot formation is completed. Then serum was separated by 10 minutes of centrifugation at 2500 rpm. Finally samples were frozen at -20°C until use [10].

### Statistical analysis

The statistical analysis was performed using the Fisher exact test and  $\chi_2$ . A *P* value of less than 0.05 was considered statistically significant.

Also a one way one-way analysis of variance (ANOVA) test use to compare groups or conditions in an experiment.

## RESULTS

In this study, selenium concentrations in 23 patients suffering from MS disease were measured and compared with 23 normal control subjects. Table 1 is as ANOVA table. This table includes six columns that last column state *p*-value. In accordance with Table 1, *P*-value is less than 0.0001. Consequently, the null hypothesis of equal means is false, *p*-value declare the two mean difference was statistically significant when we compare the two groups.

Figure 1 represents box plot for two cohorts. Great values of *F* and small values of *p*-values conclude large difference in the center lines of the boxes. The mean serum level of selenium in MS patients was determined by atomic absorption spectroscopy and the results are 60.87 $\pm$ 13  $\mu$ g/l and 85.74 $\pm$ 12  $\mu$ g/l for MS and control cohorts respectively.

Table 1. ANOVA Table for two cohorts of MS and healthy subject\*

Source	SS	DF	MS	F	Prob>F
Columns	7112.7	1	7112.7	41.71	7.14e-008
Error	7503	44	170.52		
Total	14615.7	45			

\* The Sum of the Squares (SS), Degrees Of Freedom (DF), Mean Square (MS), F ratio(F), The *p*-value(Prob>F)

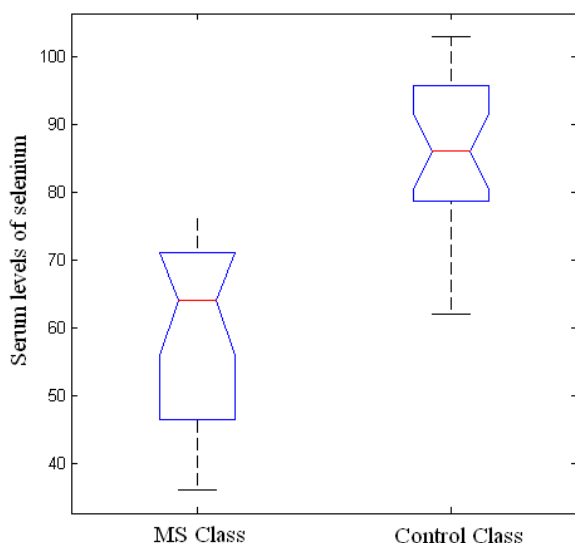


Figure 1. Box plot for 23 patients with MS and 23 healthy subjects

## DISCUSSION

The serum selenium levels of the MS patients in our study were significantly lower than those of the healthy controls. Therefore selenium is sometimes suggested for subjects with MS. The reason for this suggestion may be selenium is an antioxidant and MS subjects have low selenium levels. Selenium is an essential for activity of glutathione peroxidase (GSH-Px).

This enzyme catalyses the reaction of the oxidation of reduced glutathione to form oxidized glutathione and water [11, 12]. Based on the results of Drowkin et al. [13] low level of selenium considerably reduces GSH-Px activities levels in acquired immunodeficiency syndrome (AIDS). Hence an important correlation is between selenium and GSH-Px in AIDS. In another study, Kocyigit et al. [14] found that there was a good correlation between blood selenium values and GSH-Px activity. As previously mentioned, selenium is a component

of glutathione peroxidase. Vitamin E and selenium worked together to protect against the harmful effects of peroxide and free radicals. Selenium can bind cadmium, mercury and other metals and acts as an anti-toxic element. By this work it alleviates toxic effects cadmium and mercury [15]. In our study, it was demonstrated that the serum selenium level in MS subjects decrease compared with the control group. The explanation for this reduction can be searched features of antioxidant related to selenium. It has an essential role in the regulation of the immune system. As explained in the previous

paragraph, selenium has been found at the active sites of the enzymes which are involved in the oxidation reduction reaction [16].

This antioxidant is in the extracellular space and in the cell cytosol, in association with the cell membranes. These parts can be the possible to influence the immune processes [17]. Selenium has a protective effect against oxidative stress.

In summary, we conclude that selenium play a role in the pathophysiologic processes of MS. In order to properly define the role of selenium in patients with MS, extensive studies are needed.

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