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Editorial

Contribution of Micronutrients Intake to the Risk of Multiple Sclerosis: Is the Available Evidence Convincing?

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Multiple sclerosis (MS) is a common, chronic neurological disease of young adults, typified by neuronal demyelination and inflammation, leading to axonal injury with disease progression (1).

The prevalence of MS varies from 1 in 500 to 1 in 1500 of the population in the Europe, North America, and Australasia (2). Although the exact etiology of MS is unknown yet, genetics and environmental factors are vastly associated with the incidence of this disease (3). Nutrition is a modifiable environmental factor in the etiology of MS (4). In the current issue of the Journal, a hospital-based study in Iran has been published describing the results of an interesting case-control work about the relation between micronutrients intake and odds of MS (5). Behrooz *et al.* comparing 68 recently diagnosed cases of MS with 140 controls, found that consumption of protein and several micronutrients, including vitamins B1, B2, C, A, D and E, cobalamin, β-carotene, zinc, magnesium, calcium, and caffeine was inversely associated with the risk of MS (5).

The prevalence of MS is around 5-25 in 100,000 individuals in Iran; however, the rate has dramatically increased in the central areas of the country up to 35.5-51.9 cases in 100,000 (6). Dietary intakes seem to contribute to the etiology of MS. Earlier publications suggested that consumption of fruits and vegetables were associated with decreased risk of MS; while high intakes of energy, animal foods and high-fat dairy products were associated with increased risk (7). Protective associations of polyunsaturated unsaturated fatty acids, especially Omega-3 fatty acids, and fish consumption were also proposed (7). However, findings from cohort studies did not support the relations between intakes of total fat or major specific types of fat and the risk of MS (8). Johnson *et al.* (9) reported that gradual decrease in zinc, magnesium, selenium and vitamins B2, B6, D and E intake was associated with elevated risk of MS, and argued that vitamin B6 balances intracellular nitric acid and extracellular magnesium and is essential for nitric acid release from the cells. Therefore, deficiency of these substances might lead to increased production of intracellular nitric acid and its lowered release from the cells (9). As the dietary intakes differ in various parts of the world, assessment of common eating patterns of different parts of the globe in relation to health and disease is interesting. In Iran, a cross-sectional study has shown that most patients with MS used high amounts of hydrogenated vegetable oils before developing the disease (10). The role of *trans* fats in developing MS has also been highlighted by several other publications (8).

Although the number of publications linking diet to MS is increasing, it must be taken into account that well-designed studies examining this association are scarce. Findings from cross-sectional and case-control studies are subject to several sources of bias, and cannot provide reasonable evidence for the association. Results of cohort studies are inconsistent in this regard (11-12). While some studies have reported the protective association between vitamin D status and risk of MS, others have failed to reach such association. This is also the case for other micronutrients including vitamin C, B1, B2, A, D and E, β-carotene, magnesium, and calcium. Furthermore, when examining the association between micronutrients and MS, it is important to take into account the multi-colinearity that might arise in the statistical analyses as several micronutrients are consumed together and their dietary intakes are highly correlated. In addition, controlling for energy intake is an important step in assessing such correlation. Total energy intake has been found as a contributing factor to MS in some publications (7-8, 12). Therefore, this might confound the association between dietary micronutrients intake and MS. To account for these limitations, the approach of dietary pattern analysis has been suggested to resolve some of these potential limitations.

In conclusion, it seems that a long way should be paved to exactly determine which macro- and micro-nutrients contribute to the risk of MS. Although the available

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evidence, including the study published in the current issue of the Journal (5), is interesting, and helps moving the field forward, further well-designed studies are required to convince the researchers and public community about the role of dietary intake pattern in the etiology of MS.

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