



## MIND Diet in Delaying Parkinsonian Signs in Elderly Population

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### Abstract

Parkinsonian signs like unsteadiness of gait, rigidity, bradykinesia and tremor are very common in elderly population and can affect activities of daily living. It can predict incidence of dementia in future and is the real reason behind mortality and disability because of its progressing nature. In fact there is no known definite treatment in clinical practice at this moment. Few preventive strategies can be used to control this loss of motor functions in this age group like special diet patterns, physical activity like aerobic exercise, biofeedback balance training, avoidance of antipsychotic drugs (APD) etc. Here in this article we will review about the dietary patterns specially MIND(Mediterranean DASH intervention of neurological delay) which can delay parkinsonism and parkinsonian signs in old age population.

**Keywords:** MIND; Healthy Diet; Parkinsonism; Parkinsonian; Elderly; Motor Decline

### Introduction

It is estimated that by 85 years of age, 50% elderly population is developing parkinsonian signs. These are progressive and associated with decreased quality of life, disability, dependence and mortality [1-6]. Parkinsonian signs are not totally dependent on idiopathic Parkinson's disease (PD) or secondary parkinsonism because other risk factors may be present at the same time [7,8]. Parkinsonism is loss of ability of proper motor functioning. There is no treatment available but only preventive strategies may be beneficial. Boyle, *et al.* found the correlation of parkinsonian signs and mild cognitive impairment not related to vascular disease or vascular risk factors [9].

Current researches and evidence show vascular risk factors may be responsible for changes in brain structure and connectivity and this might be related to parkinsonian signs [10,11]. So researchers are focusing on preventable methods to control the modifiable factors like hypertension, diabetes, hypercholesterolemia etc. which in turn can delay neurodegeneration [12-14]. Role of

environmental exposures in the pathogenesis of PD is well established [15,16], however most studies that have investigated associations between PD risk and intake of individual foods and nutrients reported inconsistent results [17,18]. However, higher consumption of dairy products increased PD risk, which was independent of calcium intake [19,20].

The Mediterranean diet (MeDi) and MIND diet has received attention in recent years because of growing evidence of the association of MeDi with lower risk for Alzheimer's disease (AD) [21,22]. The MeDi is characterized by high intake of vegetables, legumes, fruits, and cereals, high intake of unsaturated fatty acids (olive oil) compared with saturated fatty acids, a moderately high intake of fish, low to moderate intake of dairy products, meat, and poultry; and regular but moderate consumption of ethanol, primarily in the form of wine, generally during meals [23-25]. The Dietary Approaches to Stop Hypertension (DASH) is a diet primarily designed to lower BP. On the contrary in a DASH dietary pattern, a special emphasis has been put on low-fat milk and dairy

products, whole grains, lean meat, fruits, and vegetables, together with the reduction of sodium intake [26,27]. Both MeDi and DASH has their own advantages but researchers are currently looking into a mixed pattern of diet called MIND which is a hybrid of MeDi and DASH for maximal benefit.

Recently Puja Agarwal, *et al.* has reported about MIND diet was associated with reduced incidence and delayed progression of parkinsonism in elderly population. They also reported moderate protection with MeDi but not for DASH diet in PD population in a community based study. This type of diet may play an important role either by altering the oxidative balance in the brain, scavenging of reactive oxygen species or by serving as a vehicle for environmental neurotoxins [28].

## Discussion

Parkinsonian signs of gait, rigidity, bradykinesia, and tremor were related to higher levels of disability in performing basic activities of daily living even after controlling for coexisting emotional, medical, and cognitive factors [29,30]. Depressive symptoms on the other hand has independent associations with parkinsonian signs and functional disability [31]. These motor signs are progressive in most individuals [32,33], and have been linked to cognitive impairment, dementia [33], and even death [32,34].

Surprisingly, Lewy bodies have not been found to be predictive of parkinsonian signs associated with aging. The presence and significance of nigral neuronal loss in older persons is also controversial and not proven [35,36]. It is believed that other nigral and extranigral pathologies contribute parkinsonian signs in aging. In persons with Alzheimer's disease, studies have shown that substantia nigra neurofibrillary pathology is nearly ubiquitous [37] and is related to parkinsonian signs [38]. Other common pathologies in older persons, such as cerebral infarctions and white matter abnormalities, have been reported to result in syndromes and signs phenotypically similar to idiopathic Parkinson's disease [39].

Healthy diet and nutrition are important in the promotion and maintenance of good health throughout the entire life process. Their role in causation of chronic diseases such as obesity, diabetes mellitus, cardiovascular disease, hypertension, stroke and some types of malignant tumours is well established

[12]. Indeed, balanced nutrition is showing itself to be a major modifiable determinant of chronic disease, with scientific evidence increasingly supporting the view that alterations in diet affect health throughout life. Indeed, dietary adjustments may not only influence present health, but may also determine whether or not an individual will develop chronic diseases much later in life [40].

Abnormalities which may cause disbalance of neuronal integrity and neurodegeneration include a large number of factors such as genetic vulnerability, endogenous or exogenous toxins, production of hydroxyl radicals, neuronal metabolic disturbances, disruption of cellular calcium homeostasis, inflammation, axonal injury and apoptosis [41,42,46]. Diet may play both causative and preventive role in the etiology of these neurodegenerative disorders in many ways as described previously. Since the symptoms of PD do not appear until up to 80% of the dopaminergic nerve cells have been lost [43,44] it is believed that some disease-promoting factors may be influenced by life habits [45,46]. A major one of these is nutrition that might slow and halt dopaminergic neuronal degeneration and even preventing the disease.

Researchers believe that in addition to diet, modifiable risks which include physical inactivity, behavioral factors and some biological factors like being overweight, dyslipidemia, hypertension and hyperinsulinaemia has been negatively associated with PD [47]. Natural antioxidants such as vitamins, polyphenols, resveratrol, or the essential omega-3 fatty acid doca hexanoic acid (DHA) can prevent dopaminergic neurons from a premature death [48]. Thereby we strongly focus on the necessity of a balanced diet that contains a high intake of fruit, vegetables, legumes, whole grains, nuts, fish and poultry and a low intake of saturated fat and a moderate intake of alcohol. All of these can be found in the so called MIND diet [49]. Unfortunately, it is very early to say that such a diet would be more effective than conventional drugs.

As we know these signs and PD itself is a gradual progressive disorder, it might be that a specific balanced diet associated with other protective measures such as drinking coffee, tea or lipid-lowering drugs could retard the progression of this clinical syndrome, by slowing the rate of dopaminergic cell death or by restoring the function of neurons. Everything that is potentially a risk for dopaminergic neurons such as chemicals and preservatives contained in processed food, in unfiltered water, vegetable and

fruits from conventional agricultural sources should be avoided as much as possible. Moreover, modifications in lifestyle should begin early and should include daily moderate exercise, reduced stress, healthy diet and nutrition with appropriate sleep hours and no tobacco smoking, however benefit of nicotine can be taken from other sources like gum [48].

Parkinsonian signs and parkinsonism in older adults can be caused by a wide range of chronic health conditions such as vascular disease, infections, multiple medications and diverse degenerative disorders such as PD and nigral degeneration in the absence of clinical PD [50]. Beneficial role of diet in Parkinson's disease was shown in two large cohorts (Health Professionals Follow up Study and Nurses' Health Study) that reported reduced Parkinson's disease risk with a prudent diet, the alternate Mediterranean score, and the Alternate Healthy Eating Index [51]. Two case-control studies also found protective relations to PD with higher adherence to the Mediterranean diet [52] and a healthy Japanese diet [53]. One Finish study reported no association between an Alternate Healthy Eating Index(AHEI) and PD risk, possible explanation could be due to changes in diet over time and the long follow-up without reassessment of diet at frequent intervals [54]. In other studies of motor decline, the Mediterranean diet was associated with slower decline in physical function in older adults (e.g. walking speed, chair rise, and balance) [55-57].

Previous studies of the MAP cohort, adherence to the MIND diet were associated with decreased risk of developing Alzheimer's disease [58], slower cognitive decline [59]. Recently a study by Cherian, *et al.* found out adherence to MIND diet was associated with slow cognitive decline in post stroke patients [60]. Brain related healthy foods in the MIND diet are specifically tested and targeted which may be the only reason we see strong positive association on motor and cognitive function. Berries and green leafy vegetables are two specific food components of the MIND diet. Berries were found to enhance motor performance (balance and coordination) in animal studies [61] as well as marginally improve gait speed and total steps error in older adults [62,63]. Dietary intakes of Vitamin E was a protective factor associated with lower risk of developing PD [64]. Dietary Vitamin E is also found to be associated with better physical performance in older adults [65,66]. Recent studies also reported about protective association of beta carotene and PD [67].

The MIND diet is a plant based diet emphasizing fruits and vegetables, legumes, whole grains, nuts, fish, poultry and low intake of saturated fats and red meats. Plant-based diets have been demonstrated to reduce oxidative stress and inflammation [68-70], two important mechanistic links for neurodegenerative disorders, including Parkinson's disease (PD) [71]. Oxidative stress promotes PD through alpha-synuclein aggregation, and inflammation causes dopaminergic neuronal loss via microglial activation [72,73]. Thus, a healthy diet rich in nutrients with antioxidants and anti-inflammatory properties may play an important role in preventing the risk for parkinsonism.

### Conclusion

We definitely do not know if parkinsonian signs can be prevented fully by specific dietary pattern like MIND, but without any second doubt we can control the modifying risk factors. Nevertheless, following a healthy dietary pattern will provide successful brain aging, preservation of dopaminergic neurons and decreased neurotoxicity in general. Further studies are required to establish these findings through replication in more diverse populations, large sample size and ultimately, a randomized diet intervention trial to confirm causality.

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