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An Analysis on Anti-oxidant Level in Parkinson's Disease Patient

T. Sudhakar, R.C. Ramya, R. Shakthi, Sindu Divakaran*

Department of Biomedical Engineering, School of Bio and Chemical Engineering, Sathyabama Institute of Science and Technology, Chennai, India

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Parkinson's disease (PD) is a progressive neurological disorder, often characterised by muscle stiffness. It majorly affects the patients above the age of 60. New research found that people who consume coffee and smoke tobacco are least affected by PD. Substantia nigra, located in the midbrain, consists of dopaminergic neurons that are responsible for motor activity. In the case of PD, these neurons die, affecting motor activity. The death of the neurons is mainly due to the insufficiency of antioxidants, which leads to oxidation and increased release of free radicals. According to a study it was found that foods rich in Vitamin C and Vitamin E were found to lower the risk of Parkinson's disease. These foods in general boost the antioxidants in the body thereby reducing the risk of PD. It's evident that the risk of PD can be reduced by antioxidants. Consumers of coffee and tobacco are least affected by PD, as they contain quercetin and nicotine respectively. These elements are rich in antioxidants too. The motive of the project is to analyse the patients based on the above theory. The project proceeds by involving 5-15 patient samples. The analysis is made with PD patients consuming coffee and smoking tobacco and patients not consuming the same.

Introduction

Parkinson's disease is a neurodegenerative disorder that causes motor impairment. People with PD may experience tremor, bradykinesia, limb rigidity and gait and balance problems. Although there is no cure, medication and surgery are serving as the only option to reduce the disease complications. PD is primarily caused by a drop in dopamine level [1,2]. This is due to the death of dopaminergic neurons in substantia nigra. Scientists haven't discovered why these neurons die. Only 10% of PD cases are related to hereditary [3]. In most cases PD is idiopathic since the causes are untold. An article revealed that consumers of coffee and tobacco are least affected by PD. But the reason is unknown. The survey was conducted in PD patients and disclosed that coffee consumers and tobacco users were less symptomatic than those who don't. Quercetin in coffee and nicotine in tobacco are neuroprotective ingredients and rich in antioxidants [4,5]. A study says that 60,000 Americans are diagnosed with PD each year. Interestingly, American diet lacks vitamin C, vitamin E which are antioxidants. This substantiates the study that antioxidant deficiency could be the major cause for death of dopaminergic neurons [6,7]. The proposed paper is trying to figure out the cause of Parkinson's disease and manifests that antioxidant plays a pivotal role in the same.

Related Studies

The Intervening with an antioxidant early in the disease process may break the degenerative cycle and improve neuron function in PD [2]. PD is the second most common neurodegenerative disorder, primarily caused by the death of dopamine-containing neurons in the substantia nigra, a region of the brain involved in motor control. While people naturally lose dopamine neurons as they age, patients with PD lose a much larger number of these neurons and the remaining cells are no longer able to compensate. They identified a toxic cascade of mitochondrial and lysosomal dysfunction initiated by an accumulation of oxidized dopamine and a protein called alpha- synuclein. Specifically, the current study demonstrated that an accumulation of oxidized dopamine depressed the activity of lysosomal glucocerebrosidase (GCase), an enzyme implicated in PD [8]. That depression, in turn, weakened overall lysosomal function and contributed to the degeneration of neurons. the dopamine damaged the neurons' mitochondria

* *Corresponding author*
sindudiva@gmail.com (Dr. Sindu Divakaran, Department of Biomedical Engineering, School of Bio and Chemical Engineering, Sathyabama Institute of Science and Technology, Chennai, India)

by increasing mitochondrial oxidant stress. These dysfunctional mitochondria led to increased oxidized dopamine levels, creating a vicious cycle and results in the death of neurons in substantia nigra.

The associations between intake of dietary antioxidant vitamins and total antioxidant capacity and risk of PD was studied [5]. Intake of dietary antioxidant vitamins C and E and ßcarotene was calculated by multiplying the mean frequency of each food item by the nutrient content of age and sexspecific portion sizes, using food composition values from the Swedish Food Administration Database. Dietary intake of ßcarotene was associated with a lower risk of PD in both women and men. There was an inverse association between dietary intake of vitamin E and PD risk in women, but the inverse association was only observed in men when vitamin E intake was analyzed as a continuous variable [9]. Dietary vitamin C intake was inversely associated with PD risk in women at borderline significance.

Smokers and coffee drinkers have a lower risk of developing Parkinson's disease [1]. The study is done specifically at cigarette smoking and caffeine consumption within families affected by the disease. The study is associated with smoking, caffeine and Parkinson's disease in 356 Parkinson's disease patients and 317 family members without the disease. Individuals with Parkinson's disease were half as likely to report ever smoking and a third as likely to report current smoking compared with unaffected relatives. Individuals with Parkinson's disease were also less likely to drink large amounts of coffee. It is also found that people who drink coffee appear to live longer. Drinking coffee was associated with a lower risk of death due to heart disease, cancer, stroke, diabetes, and kidney disease. People who consumed a cup of coffee a day were 12 per cent less likely to die compared to those who didn't drink coffee. This association was even stronger for those who drank two to three cups a day 18 per cent reduced the chance of death.

Studies of the substantia nigra after death in Parkinson's disease have suggested the presence of oxidative stress and depletion of reduced glutathione; a high level of total iron with a reduced level of ferritin; and deficiency of mitochondrial complex I [3]. New approaches designed to attenuate the effects of oxidative stress and to provide neuroprotection of striatal dopaminergic neurons in Parkinson's disease include blocking dopamine transporter by mazindol, blocking NMDA receptors by dizocilpine maleate, enhancing the survival of neurons by giving brain-derived neurotrophic factors, providing antioxidants such as vitamin E, or inhibiting monoamine oxidase B (MAO-B) by selegiline [10]. Among all of these experimental therapeutic refinements, the use of selegiline has been most successful in that it has been shown that selegiline may have a neurotrophic factor-like action rescuing striatal neurons and prolonging the survival of patients with Parkinson's disease.

Methodology

The cause of Parkinson's disease is the depletion of dopaminergic neurons. Shashikant Nigam *et al.* [9] reported that the dopaminergic neurons mainly die due to oxidative stress. Prolonged intake of caffeine and tobacco has significantly reduced the oxidative stress on Parkinson's patients. The increased oxidative stress can be neutralised by the intake of antioxidants. Patients who were chosen for the study were aged betweed 60 and 70 years. The patients who have been exposed to a minimal dosage of caffeine and nicotine over a prolonged duration, in the study it was over at least a minimum of 20 years, have shown very minimal symptoms and effects of Parkinson's disease than the ones that had minimum to no exposure [11].

Table1: Correlation between coffee/tobacco consumers with symptoms, oxidative stress and antioxidants

Patient	Coffee / tobacco consumers	Symptoms	Oxidative stress	Antioxidant
A	Didn't consume coffee/tobacco	Bilateral, dysarthria, Micrographia	Intense degradation of dopaminergic neurons, very highoxidativestress.	Least total qntioxidant capacity
B	Consumes coffee Once in a day	Unilateral, Tremor in one limb, dementia.	High oxidative stress	Low antioxidant level
C	Consumes Coffee four to Five times a day	Unilateral, asymptomatic.	Low oxidative stress	Moderate total antioxidant capacityy
D	Didn't consuMe coffee/occasional smoker	Unilateral, Slow bodily movement, Tremor in limbs.	High oxidative stress	Very low antioxid Ant level
E	Consumes coffee occasionally	Bilateral, insomnia.	High oxidative stress	Low antioxidant level
F	Didn't consume coffee/tobacco	Unilateral, Tremor in the Left hand	Very low oxidative stress	Moderate antioxidant level
G	Didn't consume coffee/tobacco	Bilateral, Micro Graphia.	High oxidative stress	Very low antioxidant level
H	Consumes coffee Twice in a day	Unilateral, soft speech	Low oxidative stress	Moderate total antioxidant capacity
I	Regular smoker	Unilateral, Anosmia	Low oxidative stress	Moderate Antioxidant level
J	Didn't consume coffee/tobacco	Bilateral, Micrographia, Depression.	Very High Oxidative Stress	Very Low Total Antioxidant Capacity

Caffeine and nicotine in coffee and tobacco respectively are rich in antioxidants. To understand the role of antioxidants better, the antioxidant levels were studied from the patient records. From which it was found that those who consume four to five cups of coffee a day gain more antioxidants than those who don't. Antioxidant reduces oxidative stress and prevents the destruction of dopaminergic neurons. The dopamine level analysis would have been an added advantage to this concept to prove the role of antioxidants to prevent the occurance of PD, but it is a majorly time consuming and expensive process, thus adhering to the antioxidant analysis proves useful in the given study.

It is observed that patients who are not consumers of coffee/ tobacco are mostly bilateral with notable symptoms of Parkinson disease and have the least Total Antioxidant Capacity. Whereas, patients who take coffee five times a day have a moderate level of antioxidants and the consequences of the disease are low.

To proceed with the project, a study was conducted among a number of patients in a neurology clinic to understand the effect of antioxidants on PD. In the study, the patients with PD were requested the following information.

1. Details about how they discovered the onset of PD in them?
2. How the tremor affects their lifestyle?
3. How long since they've been affected with PD?
4. What are the medications they've been following and for how long?
5. Does the medication help them with their condition?
6. Have they been a consumer of coffee or tobacco?
7. If yes, then for how long?
8. What are the symptoms they're facing?

After these, their symptoms were noted and compared with the consumption of coffee or tobacco. The details about oxidative stress were discussed with the neurologist to get a better idea and correlation with the study.

The table 1 shows the details collected and the correlation between the consumption of coffee/tobacco and the oxidative stress in their body. Based on the understanding of oxidative stress, the antioxidant level was analysed. From table 1 it can be understood that the consumption of coffee/ tobacco did have an effect on the symptoms of PD.

Conclusion

An analysis is performed on the consumption of Coffee/Tobacco by Parkinson's patients. From the earlier studies, it is inferred that patient's consuming coffee and tobacco are least affected by PD. The proposed idea suggests that Antioxidant has a greater influence in minimizing the onset of Parkinson's disease. After the analysis, it is found that most of the PD patients didn't have the habit of consuming coffee or tobacco. Although the study doesn't support the consumption of coffee or tobacco, it does suggest that the level of antioxidants does have a major impact on the symptoms of PD and the onset of PD. Thus improving the level of antioxidants is much needed if not in the form of coffee or tobacco at least by consuming Vitamins to reduce the level of oxidative stress experienced by the body and to reduce the onset and symptoms of PD.

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