

## Chapter 6

# Parkinson's Disease: Neuro-Cognitive Perspective

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### ABSTRACT

*Parkinson's disease is a neurodegenerative disorder characterized by severe cognitive impairments. This is a condition of degeneration of substantia nigra of basal ganglia. Parkinsonism adversely influences the mental health of the person too. Parkinson's disease was first described in 1817 by James Parkinson. Parkinsonism patients may get severe complications like cognitive deficiency, which include loss of memory, attention difficulties, visual abnormalities, slow thinking, problems with word finding, and motor symptoms. Symptoms of this disease range from Parkinson's disease mild cognitive impairment (PD-MCI) to Parkinson's disease dementia (PDD). The primary motor symptoms are trembling in hands, arms, legs, jaw, and face; rigidity or stiffness of the limbs and trunk; slowness of movement; postural instability; and impaired balance and coordination. Studies on treatments of Parkinson's disease are progressing to prevent complications and sustain the normal functions of patients.*

### INTRODUCTION

Parkinson's disease (PD) can be considered as the most complex neurologic disease, which pertains to severe cognitive deficits. Parkinson's disease was first described by James Parkinson in 1817. James Parkinson was a British physician who had published a research paper on a disease with some classical symptoms called, shaking palsy. Later the disease was named by his name and became popular in this new name Parkinson's disease (Lee et al, 2009). Vigorous researches on this disease paved the way for unfolding the mystery behind the disease for implementing better treatment modalities. In the early 1960s, researchers identified the fundamental brain defect that is a hallmark of the disease: degeneration of brain cells that produce chemicals responsible for direct muscle activities. This discovery was a turning point in medical field to devise new and even more successful therapies for Parkinson's disease (Williams-Gray & Worth, 2016).

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## **BACKGROUND**

### **General Review on Parkinson's Disease**

Parkinson's disease is a chronic, slow, progressive disorder characterized by degeneration of neurons that produce Dopamine in the Substantia Nigra near to the Basal Ganglia. It is also found that the presence of Lewy bodies and Lewy neuritis can also be the reason for Parkinsonism (Berg et al, 2014). The disease is characterized by a group of symptoms: tremors, bradykinesia or slowness of movement and postural instability or impaired balance and coordination (Armstrong & Okun, 2020). It is an unfortunate thing that PD can worsen as year goes on and reach to a stage of severe cognitive deficits and even psychosis. This leads to morbidity of patients, increased care giver burden and decreased prognosis. When patients develop cognitive impairment they may feel worthless and develop signs of depression. Later patients develop some signs of psychosis especially hallucinations and delusions. Finally there is a stage of disease where the patient will lose his or her insight completely. This is the most complex scenario of a patient with Parkinson's disease (Zahodne & Fernandez, 2010).

### **Related Anatomy and Physiology**

In order to study Parkinson's disease we need to have a brief look on anatomy and physiology of Basal Ganglia. Deep within the each cerebral hemisphere there are three nuclei collectively called Basal ganglia, which is inter-connected with the Cerebral cortex, Thalamus and Brainstem. Basal ganglia have variety of functions like motor control, cognition, emotions and learning. The nearby structures functionally connected to the Basal ganglia are the Substantia Nigra of the mid brain and sub-thalamic nuclei of the Diencephalon. Substantia Nigra is a core structure of the Basal ganglia which has cells responsible for producing Dopamine (Kordower et al, 2013). In addition to this the dopaminergic cells inside the Substantia Nigra may possess some aggregation of protein called Lewy bodies which may pre dispose Parkinsonism (Goedert et al, 2012). De-pigmentation or degeneration of Substantia Nigra can obviously result in drop in Dopamine and motor and non-motor symptoms responsible for Parkinson's disease.

### **Epidemiology**

Parkinsonism is the second commonest neurological disorder after Alzheimer's disease that affects almost 1% of individuals older than 60 years with the prevalence of 0.5 -1% and rising to 1-3% among people older than 80 years (Kalia & Lang, 2015). Among elderly population, both the prevalence and incidence of Parkinson's disease are expected to increase by more than 30% by 2030. Prevalence of this disease is more in Europe, North America and South America compared with African, Asian and Arabic countries (Kouli et al, 2018).

### **Etiology**

The causes of Parkinsonism Disease are multi-factorial. There are both genetic and environmental factors which plays major role in Parkinson's disease. The exact cause of Parkinsonism is unknown. Thus it has considered as an idiopathic disease. It was found that there is minority of cases (10-15%) that report a family history. About 5% of people with Parkinson's disease have Mendelian inheritance (Deng et al,

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