



# AN APPLIED PHYSIOLOGY OF PARKINSON'S DISEASE – AN OLD AGE NEUROLOGICAL DISORDER

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## ABSTRACT

Parkinson's disease is referred to as Kampavata in Ayurveda. Lakshanika Chikitsa is commonly associated with the various stages of disease in Ayurveda, adding importance to the prevention of further derangement. However, the development of the sickness may be understood using the multiple definitions of Bahukampavata, Snayugatavata, Kaphavruta Vyanavata, and Kampavata. Parkinson's disease is a mental illness in which 70% of the existence of Parkinson's disease is compensated, since Parkinsonism is typically treated more well in Ayurveda. In actuality, Parkinson's disease is a term used to describe persons who have Parkinson's disease but don't have any unusual symptoms and have a standard MRI that excludes all possible causes of their Parkinsonian symptoms. The main difference between the two is the medication's effect on Parkinson's disease and not the other. Parkinson's disease, the second most common neurodegenerative illness after Alzheimer's disease, affects around 1 in 1000 persons in the general population and 1% of those over 65 years old. Treatment focuses on preventing further problems and sustaining the disease.

**Keywords:** *Parkinson Disease, Ayurveda, Kampavata etc.*

## Introduction

The first conclusive proof of a genetic abnormality leading to Parkinson's disease was the discovery of alpha-Synuclein, which is significant both historically and conceptually. Some of the studies focused on family members who had been exposed to the disease. The concrete discovery of a gene defect linked to Parkinson Disease in individual families was a watershed moment, launching a wave of research into the disease's genetic

basis, culminating in more recent genome-wide association studies (GWAS), which have miraculously returned to the origins of Parkinson Disease's molecular genetic era. Tremor, rigidity, akinesia, and postural abnormalities are the four cardinal symptoms of Parkinson's disease.<sup>1</sup> The Shaking Palsy is also known as Paralysis Agitans. Although Parkinson's disease is the most frequent cause of Tremor, Rigidity, Akinesia, and Postural Disturbances, there are several additional reasons that might be explored in the differential diagnosis. Parkinsonism is responsible for 80% of the cases. Parkinson's disease specifically refers to persons who have Parkinson's disease without any unusual symptoms and who have a routine MRI that excludes all possible causes of Parkinson's symptoms. The main difference between the two is the current medication's effect on Parkinson's disease, not the other. Parkinson's disease, the second most common neurological illness after Alzheimer's disease, affects around 1 in 1000 persons in the general population and 1% of adults over 60. Because it is found solely in males and generated by Substantia Nigra, the brain area afflicted by Parkinson's, due to a sex gene, men are considerably more often affected than women. Many of the symptoms of Parkinson's disease are caused by a shortage of dopamine in the Neostriatum as a result of the loss of pigmented dopaminergic neurons in the Substantia Nigra midbrain cells. Nearly 60% of these dopaminergic neurons may have deteriorated until the clinical features of the disease emerge. Parkinsonism is divided into two types: primary and secondary. Primary Parkinsonisms are sporadic and inherited. Sporadic is also known as idiopathic, and it usually appears in late middle life and increases in frequency with age. Genetic involvement in Parkinson's disease causes mutations in at least six genes, including alpha-synuclein, uclL1, LRRK2, parkin, PINK1, and DJ-1.<sup>2</sup> Atypical Parkinsonism is a term used to describe Parkinsonism Plus Syndrome. Lewy Bodies dementia, Progressive Supranuclear Palsy, Multiple Atrophy of the System, and Corticobasal Syndrome are some of these conditions. Progressive illnesses are atypical Parkinson's diseases that show any of the signs and symptoms of Parkinson's disease but do not respond well to current medication therapy. Atypical Parkinsonian illnesses are currently not thought to be inherited. The majority of instances are caused by unknown factors; however, some may be linked to long-term pharmaceutical addiction or injury. Secondary Parkinsonism can be caused by drugs (antipsychotics, reserpine, tetrabenazine), infections (post-encephalitic infection), toxins (such as carbon disulphide), heavy metals (such as mercury), brain trauma, brain tumours, and liver failure, among other things.

### **The Structure and Function of $\alpha$ -Synuclein**

The SNCA gene produces a 140-amino-acid protein with no stable structure in aqueous conditions, earning it the moniker "Natively Unfolded Protein." At longer incubation durations, however,  $\alpha$ -Synuclein produces  $\alpha$ -helical structures that bind to negatively loaded lipids, such as phospholipids found in biological membranes, and  $\beta$ -sheet structures. The protein is divided into three sections: <sup>3</sup> a lipid-binding motif including Apo lipoprotein, which is essential to create amphiphilic helices that give  $\alpha$ -helical structures a propensity to attach to membranes;<sup>4</sup> the core hydrophobic structure (i.e. 61-95), the so-called NAC (non-A sheet), which provides capacity for the  $\beta$ -sheet and the carboxylic terminus, which is heavily loaded and vulnerable

## Methodology

Numerous periodicals, Ayurvedic and Contemporary Text Books, Reputed Newspaper Authoritative Websites, Authoritative Literature, Manuscripts, Sanskrit Dictionary, and other resources connected to Parkinson's Disease and its protein, Alpha – Synuclein Protein, were consulted.

## Clinical Manifestation

The key features are the mentioned including

1. Micrograph
2. Eye twitch reduction
3. Hypophonia
4. Dysphagia
5. Freezing
6. Resting tremors (4-6 cycles per second, pill rolling in nature, on voluntary activity and sleep disappears).
7. Rigidity

The rigidity having two forms i.e.

1. Cogwheel
2. Rigidity of the lead pipe
3. Continuous resistance to passive movement is provided by lead pipe stiffness over the whole range of motion with no variations. Cogwheel stiffness is the jerky resistance to passive movement when muscles tension and release. Bradykinesia is a slowness of movement caused by a progressive decline in pace. Other non-motor symptoms include neuropsychiatric symptoms like depression, depressive disorders, apathy, autonomic disorders like urinary dysfunction, constipation, sensory symptoms like discomfort, anxious syndrome, and olfactory dysfunction, and autonomic disorders like urinary dysfunction, constipation. In 80 percent of patients, sleep problems such as excessive drowsiness throughout the day, alterations in the REM cycle, and cognitive impairment such as dementia are present. CT, MRI, PET, and Transcranial Ultrasound, among other tests, should be used to rule out any other factors and confirm the diagnosis.
1. There are distinct phases and circumstances for different forms of Parkinson's disease. Changed (Hoehn and Yahr)<sup>5</sup> is the most used staging method. Repeated falls, incapacitation, fatigue, and dementia, as well as postural hypotension, urine incontinence, constipation, and aspiration, are all risks that are handled in the Allopathic Medicine System.
2. Physiotherapy
3. Speech therapy
4. Nutrition regulation.

## **Ayurvedic Point of View in Parkinson Disease**

The DhatuKshaya and Avarana principles have been linked to the development of neurological diseases. Snayugata Vata, Kaphavrutavyana Vata, and Kampavata are some of the Lakshanas found in Parkinson's disease. Baahukampavata is defined in Basavarajeeya as tremors on one side of the arm that impair the body's functions and cause various types of discomfort during the day and night. This is linked to the early phases of Parkinson's disease, when there is unilateral interference as well as axial involvement. "When the disordered Vatadosha is situated in the tendons, Shoola, Akshepaka, Kampa, Stambha, Anilaodbhava" is how Bhava Prakasha describes Snayugata Vata. In this case, Swedana, Upanaha, Agnikarma, and Bandhana are advised as remedies. This may be connected to the stage of illness development where Pull test recovery is affected on both sides. Bahudoshavasta is not eligible for the surgery. The Charaka Samhita's interpretation of Kapavruta Vyanavata is that if Vyanavayu is obstructed by Kapha, the body will be heavy Discomfort in all joints and bones, as well as restricted motions or severe morbidity. By way of analogy, in modern science, this can be interpreted as anatomy. The death of substantia nigra pars compact cells are the primary pathology of Parkinson's disease. Dopamine is a hormone and a neurotransmitter produced by these cells (chemical released by neurons to send signals to other cells). Dopamine promotes movement, memory<sup>6</sup>, sleep, mood, rewarding activities, and cognition. Dopamine depletion prevents muscarinic auto receptors from inhibiting acetylcholine production, resulting in excessive acetylcholine release, which eventually prunes the spines of the striatum neurons' indirect pathway projections, disrupting the flow of information from the motor control centres in the cerebral cortex.<sup>7</sup> In summary, a decrease in dopamine leads to a rise in the percentage of acetylcholine, indicating that the two are inversely related. Acetylcholine is a neurotransmitter that regulates endocrine sleep and REM sleep, as well as contracting muscles and causing pain responses. When acetylcholine levels rise, it contributes to bradykinesia, stiffness, postural disturbances, and tremors, which the Acharya refers to as Gatisanga and Adhika. Gatisanga: When Vata's normal work is impeded. This can be interpreted as stiffness, disturbances, and bradykinesia. Tremors, for example, are one example of increased activity. This is explained by the concept of Avarana, which states that the Kapha that leads to Avarana obstructs the direction of Vyanavata. The dopamine molecule is too polar to pass the blood-brain barrier.<sup>8</sup> As a result, in certain situations, L-Dopa, a dopamine precursor that can easily cross the blood-brain barrier, is used as a treatment. Initially, Avaranahara Chikitsa was also practised in Ayurveda, with Kapikachu being the most popular medication. Kampavata is a term used in Basavarajeeya to indicate the complete expression of the condition, which is physically dependent on the sufferer being bedridden or wheelchair confined.<sup>9</sup>

### **Nidana**

Primary and secondary Parkinson's disease may be comprehended via the elements of Swatantra and Paratantra Vyadhis. The causes of primary Parkinson's disease can be interpreted as Swatantra or Anubandhya Vyadhi, despite the fact that they are idiopathic. Because the therapy focuses on addressing the underlying cause rather than the subsequent symptoms, paratantra or Anubandha Vyadhis is sometimes referred to as secondary Parkinson's disease induced by secondary reasons.

### ***Sthana Sanchyay Avastha of Alpha – Synuclein Protein.***

The familial cases of SNCA multiplication showing a dose-dependent association of alpha-synuclein load to the Parkinson's disease phenotype, the autosomal-dominant inheritance trend for point mutations, and the concentration of alpha-synuclein in the brain of synucleinopathy all support the hypothesis that increased alpha-synuclein protein levels are causative in Parkinson's disease pathogenesis.<sup>10</sup> With age, alpha-synuclein protein levels in the substantia nigra rise, which is associated with lower immunostaining levels (Chu and Kordower 2007).<sup>11</sup> There is inadequate evidence that alpha-synuclein protein is abundant throughout the Parkinson's disease brain. In reality, mRNA studies in this area have been mixed, with some finding a reduction in SNCA gene expression in Parkinson's disease and others showing no change (Dachsel et al. 2007). Although average protein levels in Parkinson's disease brains are not elevated, insoluble elements, including monomeric and oligomeric species, are evidently induced. The quantity of membrane-associated monomeric alpha-synuclein in Parkinson's disease patients was only moderately elevated in the substantia nigra, but not in other brain areas, according to a systematic examination of numerous brain regions.<sup>12</sup>

In sensitive brain areas, the increase in membrane-associated alpha-synuclein was persistent (Tong et al. 2010). Neurons with the greatest levels of alpha-synuclein expression are, of course, the most vulnerable and succumb early in the illness process, allowing glia to take their place and skew the results. To partially address this issue, Gründemann et al. (2008) used laser-capture micro dissection and found a significant increase in SNCA expression in surviving PD-derived nigral neurons compared to controls.<sup>13</sup> However, this increase did not appear to be limited to SNCA (Gründemann et al. 2008).

### **Discussion**

Due to some of the Nidana stated for Vatavyadhi, the Prakupitavata contributes to Dhatukshaya and presents as Ekabahukampa, which is also observed during the early stages of Parkinson's disease. Nidana leads to Vataprakopa, which accumulates in Rikta Srotas and leads to Baahukampavata's Lakshanautpatti, according to verse<sup>14</sup>. Given Snayugatavata's Lakshanas, the potential Samprapti leading to Parkinson's disease is that the Nidana develops to Vataprakopa, which then progresses to the Snayusthana, taking Snayugatavata's Lakshana.

### ***Utpatti.***

Given the Lakshanas of Snayugatavata, the potential Samprapti leading to Parkinson's disease is that the Nidana develops to Vataprakopa, which then progresses to the Snayusthana, taking Snayugatavata's Lakshana Utpatti. Vyanavata's Avarana of Kapha may be used in the later stages when postural dysfunction and tiredness are present. The Nidana assimilates here, bringing Vataprakopa into different Sthanas, leading to Pitta and Kapha Udhirana. As a result, Kapha forms the Vyanavata Avarana.<sup>15</sup> Later on, this alludes to Rasadhidhatu's Shoshana, which emerges as Kaphavruta Vyanavata. The entire manifestation of Parkinson's disease includes resting tremors as well as being bedridden or wheelchair confined. The Kampavata Lakshanas can be seen as the complete expression of Parkinson's disease, leading to sleepless nights and leaving the sufferer emaciated, much

like Kampa in the body.<sup>16,17,18</sup> Nidana leads to Dhatukshaya's Avastha, which is home to Vataprakopa. The Vriddhi in question is that of Vyanavata.<sup>19</sup>. Rasayanis distribute this, which aids Kampavata's manifestation.

## Conclusion

Because the origin of Parkinson's disease is unknown, the goal of treatment is to prevent the condition from deteriorating further. In Ayurveda, the Lakshanika Chikitsa is frequently used in the treatment of Parkinson's disease. As a result, wherever feasible, the proper diagnosis should be established, and the Oushadi and procedures that assist in this should be followed, while keeping in mind our limitations.

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