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Original Research Paper

Neuropsychology

AN EXPLORATORY STUDY ON THE CHALLENGES OF PARKINSON'S DISEASE IN URBAN INDIA

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ABSTRACT Parkinson's disease has become a lifestyle factor in India in recent years. The research paper attempts to understand the reasons behind the spread of the disease as well as control it through various means like allopath medicine, allelopathy, homeopath and ayurveda, as well as prevent its increase through holistic lifestyle changes. **Research question:** The paper will attempt to analyse the increasing incidents of Parkinson's disease in the world today. What are the reasons behind this phenomenon? Can it be cured? Is it an urban phenomenon or pertains to rural areas as well? Is there any prevention for such a disease? These and other such questions will be attempted to be answered in the course of this paper.

KEYWORDS :

1. INTRODUCTION:

Parkinson's disease is a recognizable clinical syndrome with a range of causes and clinical presentations. It represents a fast-growing neurodegenerative condition. The rising prevalence worldwide resembles the characteristics that are typically observed during a pandemic. The only difference is that it is not infectious. It has a large effect on the society and for reasons that are not yet fully understood. The incidence and prevalence of this disease has risen rapidly in the last two decades.

The other concerning issue with respect to the disease is that it has a slow progression with accumulating disability for the affected individuals which can span decades. Besides the discomfort and problems that are faced by the people who are afflicted by the disease, it also takes its toll on the caregivers. Besides this, it has a mounting socio-economic burden on the society.

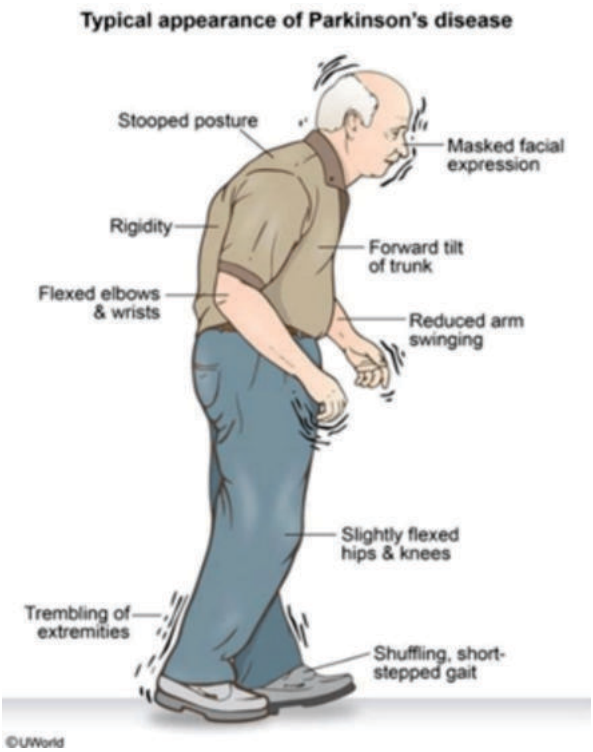

Figure 1: Appearance of a person afflicted by Parkinson's disease

Source: www.rsepress.com

In 1967, Hoehn and Yahr defined the five stages of Parkinson's disease based on how the motor symptoms progressed with each stage. The five stages include:

Stage 1.0: **Unilateral involvement only** which involves tremors and movement symptoms on one side of the body only

Stage 1.5: **Unilateral and Axial involvement:** the patient has some signs of tremors; their walk is rigid and slow. They have limited movement.

Stage 2.0: **Bilateral involvement without impairment of balance** which involves harsher symptoms with tremors through both sides of the body and a poor posture

Stage 2.5: **Mild bilateral involvement with recovery on pull test:** the pull test for a Parkinson's patient involves pulling on their shoulder and trying to make them fall backwards.

If the patient is in a position to regain his sense of gravity, it means that he does not seem to be suffering from acute Parkinson's disease.

Stage 3.0: **Mild to moderate bilateral involvement, some postural instability but physically independent**, considered as a mid-stage involving unsteadiness and loss of balance

Stage 4.0: **Severe disability, still able to walk and stand unassisted** which involves the symptoms developing entirely

Stage 5.0: **Wheelchair-bound or bedridden unless aided**, regarded as the most critical stage as the legs stiffen, making it impossible to locomote

2. Definition:

Parkison's is a disorder of the central nervous system that affects movement and is normally characterised by problems in movement. It often includes tremors of hands.

The other symptoms are slow movement, stiffness and loss of balance. It is a progressive disorder that affects the nervous system and parts of the body controlled by the nerves.

The condition is named after James Parkinson who in 1817 described the shaking palsy. The term was coined by William Rutherford Sanders of Edinburgh in 1865 and later entered general usage through the influence of Jean-Martin-Charcote.

The history of Parkinson's disease includes four periods:

- Clinical; The onset of motor science in Parkinson's disease is typically asymmetric, with the most common initial finding being an asymmetric resting tremor in an upper extremity. Over time patients notice symptoms related to progressive bradykinesia and rigidity.
- Neuropathological; The disease is pathologically heterogeneous, with the most common pathologic substrates related to abnormalities in the presynaptic protein α- synuclein or the microtubule-binding protein.

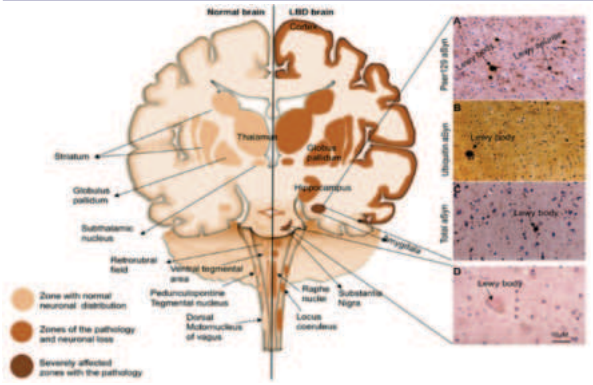

Figure 2: Difference in a normal and degenerated brain structure

Source: www.frontiersin.org/

- Neurosurgical; surgical treatment consists of various neurophysiological approaches and biochemical discoveries which open the way to medical treatment
- Biochemical

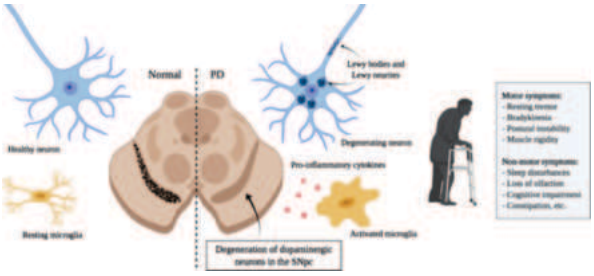

Figure 3: Impact of the degeneration of PD on the neurons

Source: https://content.iospress.com/

PD is a progressive neurodegenerative disorder and is mainly caused by the lack of dopamine in the brain. Dopamine is a neurotransmitter involved in movement, motivation, memory and other functions; its level is decreased in a PD-affected brain as a result of dopaminergic cell death.

This causes motor deficiency and is a reason for the cognitive deficit observed in some patients suffering from PD. It is not easily detectable at an early stage because of the long period between the first damage to dopaminergic cells and the onset of clinical symptoms.

The symptoms and signs of PD usually do not develop until 70-80% of their dopaminergic neurons have already been lost.

Identifying patients in the period between the presumed onset of dopaminergic cell loss and the appearance of clinical parkinsonism may be of major importance for the development of effective neuroprotective treatment strategies. It is important to monitor its progression so that therapeutic intervention can start at an early stage.

PD biomarkers can be divided into four main types:

- Clinical
- Imaging
- Biochemical
- Genetic

Protein biomarkers, dopamine metabolites, amino acids etc in blood, serum, and cerebrospinal liquid were considered the most promising but the new efficient forms are α-synuclein. Recent studies suggest that microRNA-based analysis may achieve significant progress especially if it is combined with α-synuclein data.

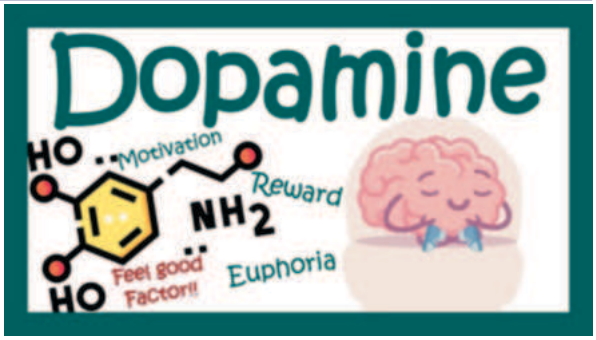

Figure 4: Explicit image about Dopamine and its effects
Source: YouTube

3. Important neurochemical biomarkers:

3.1 Orexin

Orexin is a neuropeptide hormone and is also known as hypocretin. This hormone regulates physiological functions such as sleep-wake cycles, heart rate and hypertension. Most PD patients usually suffer from narcolepsy due to the loss of hypocretin neurons in the hypothalamus and symptoms may include daytime sleepiness and hallucinations. These are the very same symptoms that are prevalent in patients who suffer from PD. The other symptoms that these patients suffer from are stiffness of the limbs, tremors at rest, difficulty in walking, impaired balance, small handwriting, stooped posture, softness of voice and problems in swallowing. The other non-motor factor symptoms include the reduced ability to smell, sleep issues, constipation and low blood pressure while standing up, the reasons being changes in brain chemicals.

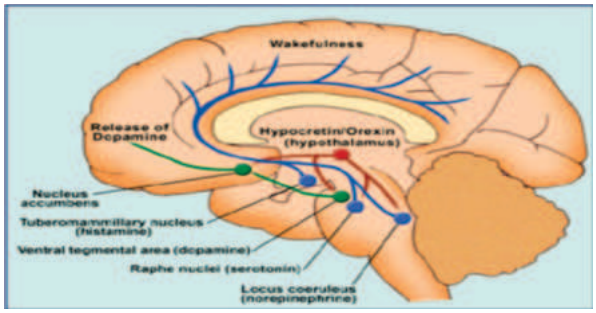

Figure 5: A diagram showing the main projections of orexin neurons
Source: https://www.researchgate.net/

3.2 Acetylcholine

In PD, dopamine depletion blocks auto-inhibition of acetylcholine release through muscarinic auto receptors which leads to excessive acetylcholine release. When excessive acetylcholine is released, it leads to the firing of motor neurons which in turn impact voluntary movements. This chemical is a key neurotransmitter which is found in both the central and peripheral nervous system in addition to being an endocrine hormone.

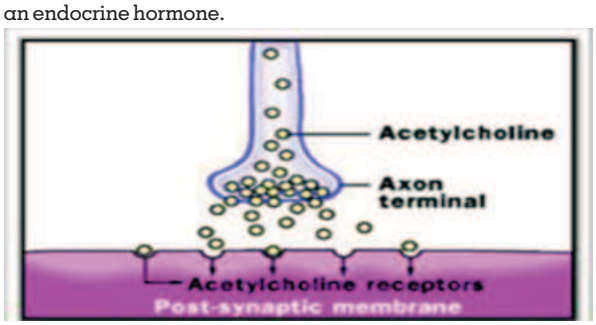

Figure 6: Depiction of the release of acetylcholine

Source: https://www.researchgate.net/

4. Background of reasons for the spread of Parkinson's disease in India

Research has indicated that there have been relatively less numbers of individuals affected by PD in India. Most of the genetic mutations found to cause PD in the population across the world do not seem to be present in India, indicating clearly that there is a history of 'genes' which is the cause of the prevalence of the disease.

Research by De Lau and Breteler in 2006 estimated that 10 million people in the world (approximately 0.3% of the world's population and 1% above 60 years of age) were found to be affected by the disease.

In India, there have been door-to-door research surveys done in Bangalore and Kolkata along with a rural-urban emphasis and also gender.

The epidemiology in India seems to be different as compared to other countries in the world indicating that the genetic mutations which are an important factor that causes PD is not found in India. This means that there might be another set of genetic factors that might be involved. Studies have indicated that women have a lesser prevalence of developing PD.

This has been corroborated by the All India Institute of Medical Sciences by (Yadav et al and this is in 'A Case Control study of women with Parkinson's Disease and their fertility characteristics'; J Neurol Sci 2012), indicating a protective role of the hormone oestrogen.

Certain research papers have used studies from the National Institute of Mental Health and Neurosciences (NIMHNS) used different languages and questionnaires which indicated greater sensitivity with respect to understanding the spread of the disease resulting in better responses.

The epidemiology of PD in India is different compared to populations from different countries and among different ethnicities in India. Most of the studies have been conducted on a small sample size from specific areas with a particular type of cultural background so to generalize it for the rest of the population may be incorrect as the country has a huge cultural, ethnic and social difference.

4.1 Risk Factors

1) The male gender seems to have a higher incidence of the disease than the female population. This is true for other countries in the world, but this result may not be completely correct as the fact is that in India women are less likely to seek or have access to medical attention compared to men.

2) Family history of PD as well as previous history of depression were other factors which are likely to increase the incidence of PD. Environmental risk factors like rural living, well water drinking, farming and pesticide exposure are factors which need to be considered while analysing the incidence of the disease.

3) Environmental toxins are a major contributor towards the onset of PD which has been linked to constant exposure towards the chemicals. Neurotoxins in the brain can lead to oxidative stress which is common through heavy metals such as iron and copper and neurotransmitter disruption.

Exposure to other heavy metals such as manganese, lead and mercury can lead to impaired motor skills and in some cases, neuronal death (death of the neuron cell which is irreversible which is an injury caused to the nervous system of the body).

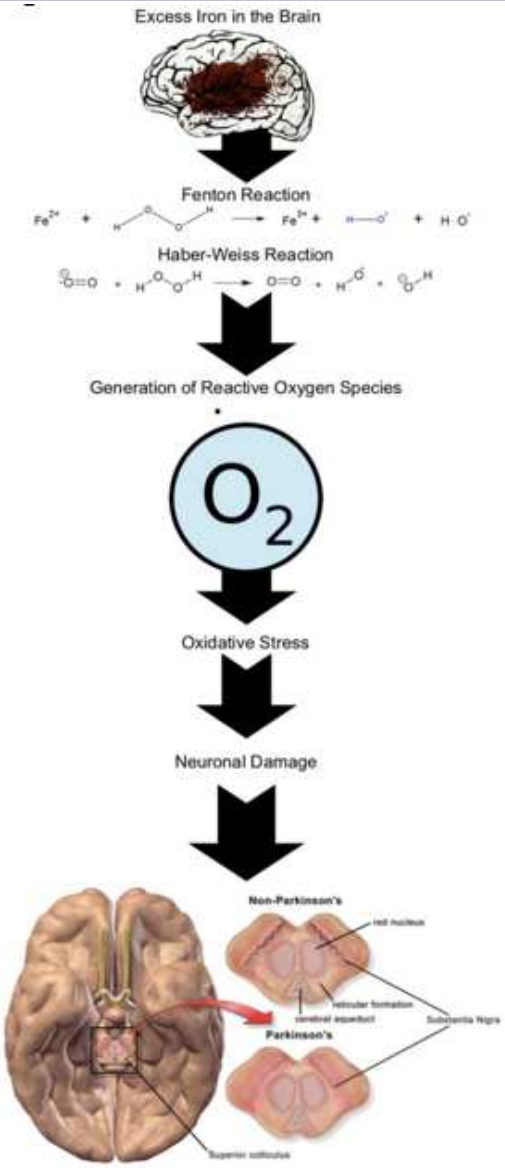

Figure 7: Oxidative stress in the brain due to constant exposure to iron

Source: https://www.nlm.nih.gov/

Pesticides, used to reduce disease and control pests also play a significant role in the development of PD due to their ability to destroy dopamine-producing neurons in the brain and create neurological imbalances.

4) Genetic evidence indicates that individuals whose mother tongue is Parsi are more prone to diseases like PD and this becomes more apparent because they marry within each other. This particular set has integrated itself into the Indian ethos. They have simultaneously maintained their own ethnic identity with respect to language and history. A study by Muhammed Tufail in the National Library of Medicine journal indicated that the risk of PD is higher in patients with consanguineous marriages (marriages between relatives who are second cousins or closer). If the relative is a first cousin, then the research indicates that 59.3%, which is more than half are likely to develop PD. The percentage drops if they are second cousins (29.5%) and between third cousins, drops to 11.1%. This is very rampant in Pakistan.

4.2 Symptoms

With the onset of PD, there are certain typical medical

impairments which are prevalent in the patient. The most common ones are listed below along with their increased occurrence.

Table 1: Symptoms of PD and their % prevalence

Symptoms	Percentage (%)
Speech impairment	60-80
Speech impairment in the last stage	100
Slow reading speed	64.7
Hoarseness of voice	60.2
Articulatory effect	39.8
Jerky Speech	30.2

Source: Lazarus et al; Indian Speech and Hearing Association (ISHA)

Besides the above, the other common symptom is 'restless leg syndrome (RLS)'. This was found to be higher in patients suffering from PD than any other neurodegenerative disorder. The onset of PD results in the appearance of both motor and non-motor symptoms. The most common and widely prevalent motor symptoms include tremors and bradykinesia (slowness of movement) and non-motor symptoms -which do not affect movement- include daytime sleepiness, cramps and constipation. Unusual effects such as an increase in the consumption of sweets, gambling and excessive spending are also non-motor symptoms but usually go unreported as they may be deemed inappropriate.

5. Recent developments on the cure of Parkinson's disease

5.1 The Prevention of PD

PD is a progressive neurological disorder that causes movement and postural problems. While there is no way to completely prevent it, symptoms and severity of the disease can be delayed with lifestyle changes and habits.

The most common ways of preventing the development of Parkinson's disease include:

1. Exercising regularly, with the best exercises focusing on yoga, walking and aerobics. Exercising helps prevent PD alongside also improving the health of the people already diagnosed with PD.
2. Consuming a healthy diet with lots of fruits, vegetables and meat which are rich sources of antioxidants and omega-3 fatty acids.
3. Avoiding harmful toxin exposure (pesticides, insecticides) as they have proven to increase the risk of developing PD.

5.2 Cures for Parkinson's disease

Parkinson's disease can be cured using different types of treatment strategies including:

1. Allelopathic cures: Allelopathy is a phenomenon that involves the secretion of compounds by one plant that can either positively or negatively affect the neighbouring plants. Levodopa, also known as L-Dopa is a plant-derived antioxidant secreted by some legumes that shows strong allelopathic activity. It is a precursor to dopamine and is used for the treatment of Parkinson's disease. Levodopa enters the brain and acts as a replacement for the missing dopamine which allows for better movement and stability as a lack of dopamine had previously resulted in symptoms such as stiffness and lack of movement.

2. Allopathic cures: There have been improvements and discoveries in treatments for PD and scientists have also discovered new drugs for the same. Dopamine antagonists, which act like dopamine when inside the brain, are one type of drug prescribed which includes common ones like Mirapex and Neupro. MAO-B inhibitors are also suggested which work to block the chemicals that cause the breakdown of dopamine in the brain. Some of these inhibitors include Eldepryl and Rasagiline.

Figure 8: The effect of medicinal drugs on neuronal activity
Source: https://parkinsonsdisease.net/medications

3. Homeopathic cures: Homeopathic treatment can bring about change in the symptoms of a person experiencing PD and also, apart from treating it, prevent its relapse in the future. The topmost remedies include:

a) *Causticum*- This is a medicine used for treating extreme rigidity and stiffness experienced during PD. Maintaining balance and postural issues are major symptoms that can be solved with this medicine.
b) *Zincum metallicum*- This is a major remedy for restlessness. It majorly helps in the treatment of hand tremors by providing strength to the nerves in the body.
c) *Argentum nitricum*- It helps control trembling and encourages muscle coordination. Patients with an impaired balance and lack of control over their walking are suitable for consuming this.

4. Ayurvedic cures: Herbs are the cure to PD in Ayurvedic treatment. These herbs contain antioxidant and neuroprotective properties which can greatly help alleviate the symptoms of PD. Some of the herbs are listed below.

a) Brahmi- This herb induces cognitive-enhancing properties. It improves circulation to the brain, uplifting mood along with enhancing cognitive growth, as a decline in mental health might occur as time elapses.
b) Kapikacchu- Also known as *Mucuna Pruriens*, contains levodopa. It supports the nervous system of the body which is a useful trait when treating patients suffering from PD.
c) Ashwagandha- It is an adaptogenic herb (plants that help your body respond to stress and help alleviate it) which helps manage stress, depression and anxiety experienced while suffering from PD.

5.3 Lifestyle changes when suffering from PD

Quality of life while suffering from PD can be drastically improved with small lifestyle changes that can improve health and well-being. Integrative therapies (tailoring therapeutic techniques specifically to an individual) can be encouraged to follow a nonmedical approach to the treatment of PD. Some of these include:

a) Nutritional supplements such as Vitamin D, Coenzyme Q10, NADH and creatine can be consumed which are said to increase dopamine levels in the body, act as a source of energy and might help slow down the progression of PD.
b) Yoga helps increase fitness and balance and increases mobility and flexibility, ideal for a patient with PD as his/her movements are unstable.
c) Acupuncture is a traditional Chinese method to alleviate points and stimulate the body's energy pathways and is a common therapy for PD. It can help delay the progression of the symptoms and also decrease its side effects.
d) Movement therapies which include music therapy, strength training and exercise and the Alexander technique (rediscovers natural balance and control)

which focuses on posture and balance and helps improve stability, are common techniques to acquire better motor skills and overcome the disease.

Figure 9: Managing symptoms of PD
Source: https://www.homage.com.my/

CONCLUSION

Parkinson's disease in India has been increasing. This is a disturbing factor which needs to be addressed by involving all stakeholders. This disease is a neurodegenerative disorder that is diagnosed based on its clinical motor and non-motor symptoms. While the cause remains largely undecided, factors including age, sex, exposure to various chemicals and consanguineous marriages can result in its onset. The primary goal for treating a patient suffering from Parkinson's is improving their quality of life and while one specific treatment or medication is not known for PD, lifestyle changes and different medical pathways (allelopathy, allopathy, homeopathy, ayurveda) can be chosen to alleviate its symptoms, delay its onset or prevent it.

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