



# MOCHADO'S DISEASE

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## INTRODUCTION

The year is 2043. Neurologists have discovered a new, progressive neurodegenerative condition that has put the world on notice. This report will investigate the root cause of Mochado's Disease and propose a solution that will be beneficial for all individuals affected by the disease.

### **What is Mochado's Disease?**

Mochado's Disease is a newly discovered pediatric neurodegenerative disease seen around the world. Previously the common neurodegenerative diseases are Alzheimer's Disease, Parkinson's Disease, and Lewy Body Dementia. Neurodegenerative diseases affect the central

nervous system (CNS), especially the brain which controls the body's movement. The brain is a very important vessel of the body that controls one's daily activity. To combat Mochado's Disease, this project focuses on the human body from the newborn to adulthood stage.

The nervous system is going to be looked at the most since this project has a heavy focus on neurotransmitters and neurodegenerative disease. The muscular system is going to look at the structure and movement of the child(ren). The integumentary system is going to be looked at to affect this disease on the skin. The endocrine system is going to look at the hormones of pregnant women and their impact on the offspring/newborn. The skeletal system is going to be looked at for the formation of bones and joints.

## **BACKGROUND**

### **What is Mochado's Disease?**

Mochado's Disease is a neurodegenerative disease that affects behavior, thinking, and memory which affects motor and non-motor deficits associated with dopamine deficiency, thus affecting behavior, thinking, and memory.

### **Impacts**

Mochado's disease mainly affects pregnant women and children through the results of this unknowing neurodegenerative disease. There is a significant impact on a person's physical, emotional social well-being, as well as the ability to communicate is also impacted. The disease mainly exploits the nervous system, muscular system, integumentary system, endocrine system, and skeletal system. The nervous system is largely impacted due to effects on neurotransmitters as the brain forms gaps and other systems in the body experience deterioration.

## **Common Neurodegenerative Diseases**

### **What is Alzheimer's Disease?**

Alzheimer's Disease is a neurodegenerative disease that affects men and women. This brain disorder affects the portions of behavior, thinking, and memory. Dr. Alois Alzheimer, a German psychiatrist, and his colleague Emil Kraepelin discovered this neurodegenerative disease from Auguste Deter, a patient with smaller brain gaps. The signs and symptoms of the early (mild) stage are repetitive questions and poor judgment. People with Alzheimer's Disease in the mild stage are having low energy to the point where there is a lack of interest in school or work. The signs and symptoms of the middle (moderate) stage are increased memory loss and difficulty thinking. People with Alzheimer's Disease in the moderate stage is speech rambling and wandering. The signs and symptoms of the late (severe) stage are the

lack of ability to communicate and difficulty swallowing. People with Alzheimer's Disease in the severe stage are seeing hallucinations and chaining of personality.

### **What is Parkinson's Disease?**

Parkinson's Disease is a neurodegenerative disease is an age-related progressive neurodegenerative disease associated with Dopamine deficiency and both motor and onomotor deficits. The disease results in the loss of dopaminergic neurons in the brain associated with Lewy bodies containing alpha-synuclein aggregates. The signs and symptoms of the early stage are difficulties thinking and poor judgment. People with Parkinson's Disease are in the early stage when a particular side of the body is affected. The signs and symptoms of the middle stage are memory loss and increased tremors. People with Parkinson's Disease in the middle stage are a loss of facial expression and speech difficulties. The signs and symptoms of the late stage are inability to communicate, difficulty swallowing, and falling frequently. People with Parkinson's Disease in the late stage are unable to walk and have hallucinations with cognitive impairment.

### **What is Lewy Body Dementia?**

Lewy Body Dementia is a neurodegenerative disease under the umbrella of Dementia. Typically dementia is a brain disorder where the ability to communicate is affected. The process of thinking, behavior, and feeling is impacted. This is the second most common form of dementia affecting a greater portion of the elderly demographic. LBD was discovered by Dr. Federico Lewy who associated LBD with PDs. Currently, LBD is associated with ADs. The signs and symptoms of the early stage are difficulties with moving. People with Lewy body dementia in the early stage are tremors. The signs and symptoms of the middle stage are difficulties with speech difficulty. People with Lewy body dementia in the middle stage are frequently falling. The signs and symptoms of the late stage are speech difficulty. People with Lewy body dementia in the late stage have rapid infections.

### **What is the connection of Alzheimer's Disease, Parkinson's Disease and Lewy Body Dementia with Mochado's Disease?**

The connection between these three neurodegenerative diseases and Mochado's Disease is the direct brain loss, hallucinations, and tremors. All neurodegenerative diseases impact newborns and adults.

## **AIMS**

The goal of this project is to understand the similarity and differences among the neurodegenerative diseases: Alzheimer's Disease, Parkinson's Disease, and Lewy Body Dementia (1), comparing the demographics of newborns and pregnant women affected

around the world (2), and decreasing the effects of Machado's Disease through therapy (3). When completing this project, ethical consideration is the top priority when creating medication, hiring staff, and distributing the drug therapy across the world.

## SOLUTIONS

Mochado's Disease is going to be fixed by looking at the various aspects of the neurodegenerative disease, lifestyle, prenatal vitamins, and brain therapy. There is a heavy emphasis on the different neurodegenerative diseases and the understanding of how they can be found in children. Lifestyle changes such as stress, diet, and exercise can have negative and positive effects on the body. Prenatal vitamins such as folic acid, iron, vitamin D, and calcium help to form the body correctly for the entire pregnancy term. Brain therapy will help to fix the imbalance of acetylcholine and dopamine. The solutions of the project will look at the pre-birth and post-birth phases of life.

The two aspects of this project are the clinical trials and the usage of therapies. Since Modado's Disease is seen in newborn children, age is one of the primary indicators of early neurodegenerative disease. Age permits the ability to see the incline and decline progress to identify possible problems and solutions for research. Mochado's is noticed in newborns whose legs are shaped compared to normal structural formation. There is going to be an observation of the increased signs and symptoms during this life span. As the patient ages, some will be diagnosed with this severe neurodegenerative disease.

Clinical trials help to see the positive and negative results when working on medications. The team working on the trial will consist of scientists. Biologists such as neuroscientists, biotechnologists, pathologists, microbiologists, geneticists, and bioinformatics will look at the impact of the medications inside and outside the body. Chemists and physicists will work with pharmacists to see the structures of each compound and ensure that the mathematical formulas are correct. The activation or deactivation of neurotransmitters during pregnancy can be seen in Parkinson's Disease and Alzheimer's Disease. Typically, women go through postpartum depression after birth. Dopamine is the neurotransmitter for movement, motivation, sleep, and cognition. Dopamine is associated with reward and has a role in fight or flight. A lower level of dopamine is associated with Parkinson's Disease. Acetylcholine is a neurotransmitter for learning, memory, and processing. With acetylcholine, women will go through memory loss known as mommy brain during pregnancy. Lower levels of acetylcholine are associated with Alzheimer's Disease.

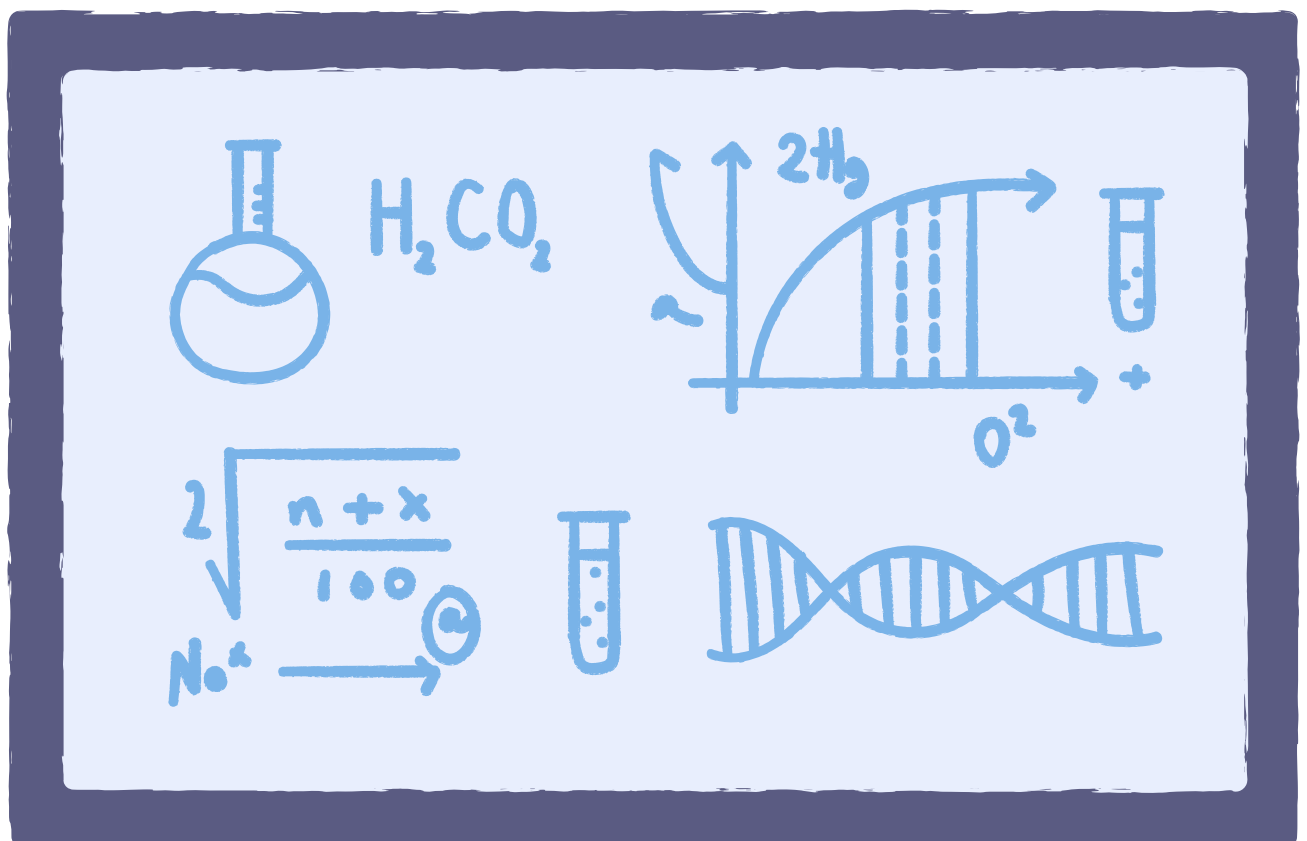
Therapies are important for pre-birth and post-birth because neurodegenerative disorders can occur at any time of life. A team of physical therapists, occupational therapists, speech therapists, and nutritional therapists. Physical therapists and occupational therapists will help the pediatric patients to give back mobility, and allow for the continuation of daily activities and motor skills. Speech therapists will hire speech and language pathologists to help with speech impairments and disorders to have more effective communication.

Nutritional therapy helps to ensure the food plate is balanced with vegetables, proteins, carbs, fats, supplements, dairy, and grain/starches.

## METHODS

The methodology of this research project consists of in vitro and in vivo approaches. The creation of drug therapy is the first method. This drug therapy helps the homeostasis of the hormones, the neurotransmitters, and the regulation of stress levels. In the vivo approach this project uses multiple various animal models such as mice and zebrafish. In the vitro approach, this project focuses on the drug interaction, toxicity, and potential side effects of the clinical trials. With the multiple rounds in this project, it ensures that it is authentic and has been following the proper guidelines. This project aims to prevent the complexity and progression of neurodegenerative disease.

Therapy is the second method that allows pediatric patients and families. Our goal is for the children to gain mobility in the brain and body. This medication will help to restore brain memory, thinking, and emotional functions from Alzheimer's Disease, and stop the tremors from Parkinson's Disease and hallucinations from Lewy Body Dementia. The therapies of physical and occupational therapy in this project allow the children to gain back body strength. The ability to just keep up with daily activity is crucial in independent growth and is what our project aims to provide to patients affected.



## **A. CLINICAL TRIALS**

The clinical trials are based on the creation of drug therapy. Gathering scientists and physicians together based on the public's concerns. Each phase has been thoroughly checked out with multiple experiments being conducted to fix errors that may occur. Based on these stages, the preferred timing of this research is 1 year long. The preclinical trials consist of looking at the reports and cases around the world. In stage 1, participants will be chosen, staff in the medical and scientific fields are hired and the supplies have been ordered. In stage 2, manufacturers have started creating medications and an increase of participants of 50-100 individuals helps to ensure that the data is not biased. In vivo and in vitro laboratory approaches are done based on the equipment and animal subjects. The Food and Drug Administration (FDA) is checking that the safety guidelines are being followed. In stage 3, the FDA has approved this medication and an increased number of 100-500 participants have been chosen. In stage 4, the distribution of medications around the world is done and an increase of 500-1000 individuals have been chosen.

### **Stage 1**

Our first sample size is a collection of 1-50 women with infants with the common signs and symptoms of AD, PD, and LBD. Collection of getting parental consent from those with infants until aged 18 years old. The third collection sample is looking at the results of adults who have progressive neurodegenerative disease so the creation of stronger medication is to be effective. This is a year worth of research with increased sample size and average third-month timing in the clinical trials. The quantitative data used is looking at an independent variable of the treatment and therapy and the dependable variable is increasing or decreasing dosage and therapy session.

### **Stage 2**

#### **1. Drug Therapy [Medication]**

- Dosage
  - Adults will be given 10-20 milligrams (mg) of tablets or capsules for oral medication. These medications must not overwhelm the bodies of women who have higher levels of hormonal balance.
  - For children, the dosage must be administered based on age. The children will be given 1-2 milligrams (mg) of liquid oral medication using a syringe which needs to be taken daily until brain gaps are closed (increases).
- Error
  - In this project, unforeseen errors could occur when creating the medications. In the brain, more neurotransmitters shut down. When conducting research, redoing the experiments based on prior failed attempts. This may result in expensive laboratory equipment as the technology needs to be up to date. An indicator that has not been focused on the most is the idea of women having

kids at an older age which results in disorders appearing. Having children at an older age will possibly result in the likely chance of birth defects. Unfortunately, the untimely deaths of pediatric or adult patients will have research know the errors of the project.

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- Magnetic resonance imaging (MRI)

- With Alzheimer's Disease, physicians and nurses are able to see the brain grapes at the hospital or doctor's office.

- X Ray

- With Parkinson's Disease, orthopedic surgeons will identify the location of dislocation and fractures. Osteoporosis is a common brain disorder seen with neurodegenerative disease.

- Computerized Tomography (CT) Scan

- CT Scan helps to see the location of tremors, and the size of the brains and diagnose the early stage of each neurodegenerative disease.

- Ultrasound

- Obstetricians and gynecologists can look at the baby's formation. If and when abnormalities occur, OBGYNs can alter other physicians' observations.

## 2. Therapies

- Hiring therapists and technicians in various medical careers.

### **Stage 3**

- The Food and Drug Administration (FDA) approval is to be completed within 1-5 years (2-year maximum) of creation.

### **Stage 4**

- Seen at pharmacies within an affordable cost with and without insurance around the world.

## **B. TESTING**

### **1. Genetic Condition (Family history of the maternal and paternal side)**

- Autosomal Dominant & Recessive
  - Autosomal Dominant: Condition presented in the bloodlines where the person goes to each generation. A person with Machado's disease which show the physical appearance.
  - Autosomal Recessive: Condition presented in the bloodlines but it is suppressed as it skips generations where the person may or may not present the gene.
- Mitochondrial
  - Machado's Disease is a mitochondrial disorder since the children will be inheriting this condition from the mothers.

### **2. Animal Models Of Mice and Zebrafish**

- With the animals, we can see the normal and non-normal brain gaps with Alzheimer's Disease. We will see the effects of turning on or off the neurotransmitters. Pregnant animals will be given prenatal medication to see when the brain abnormalities happened. The animals will help to see the tremors based on Parkinson's Disease. When the animals are being trained, they will see those with memory, thinking, and emotion associated with Alzheimer's Disease.

## **C. HEALTHCARE WORKERS**

- Physicians specialized in orthopedic surgeons, neurology, pediatrics, family medicine, obstetrician and gynecologist, neonatologist, pathologist, urologists, psychiatrists, otolaryngologists, and pulmonologists. Nurses specialized in the ICU, ER, and NICU. Other healthcare careers in pharmacy, physician assistant, occupational therapist, physical therapist, social worker, and speech and language pathologist. Students in medical, physical therapy, occupational therapy, physician assistant, and nursing school. Volunteers can be considered to work with the team at hospitals or clinics.

# **ADVANTAGES AND DISADVANTAGES**

## **PROS**

- Creating medication
  - Ensuring that the cost of the medication is affordable to women around the world. Passing all the standards according to the FDA guidelines. Working with a team of scientists and physicians.
- Effective collaboration



- Working with other scientists and physicians around the world helps to prevent hidden information. Toward the end of the projects, the proper acknowledgements will be given to those who are all working together for effective teamwork.
- Collection of new data
  - Since this project is considered brand new, the data from this project will assist with future projects amongst researchers.

## CONS

- Socio-economic conflicts will rise when society and economics go against each other resulting in the high, middle, and lower class levels changing.
- Political challenges will arise with the egos and attitudes of government officials representing the nations worldwide. Countries would choose to give their citizens the treatment. Countries would only have the treatment in that only specific country.
- Equipment will have to be ordered so data can be accurate without any favoritism showing up. There needs to be enough equipment so they can run multiple experiments inside and outside of the laboratory setting. Technology can shut down or stop working.
- Staff will have negative effects because physicians will require different salaries based on experience. Some staff would be hard to get because of scheduling (physicians). Some staff may be local (within the state) or distant (out of state).
- Time consumption is going to be the main concern because of the expectancy of this research will take longer. The expected time for each phase may take longer or shorter than usual.

## LIMITATIONS

- Sample size
  - Choosing a smaller participant size and choosing a larger participant size is based on the specific phase of clinical trials. The possibility that participants would possibly back out of the research due to personal reasons.
- Lack of previous information
  - Due to this being not known, there is limited knowledge about Mochado's Disease as scientists and teams will be working together.
- Lack of diversity
  - Hesitancy from patients who don't trust the physicians due to personal reasons.
- Self-report bias
  - Not properly documenting the signs and symptoms. Participants do not want to be labeled outside of the 'normal' boundaries of society's standards
- Funding

- With the lack of funding, this project will have to cut down expenses in different parts of the budget.

## **CHALLENGES**

- Financial Challenges
  - Inflation, shortage, poverty, and unemployment are some of the financial challenges that occur when there is not a stable economy. The lack of a stable economy will not give people of different classes the ability to pay for medication.
- Political Corruption
  - Inequality is seen when the government does not have or follow its law, rules, and regulation in the country.
- Health Problems
  - When looking at creating these medications, this can lead to turning on or off signals, receptors, and neurons. This project must not cause other problems since the brain is the main focus. The brain is the most important part of the body as it controls daily life activities.

## **Addressing Limitations and Challenges**

- Cost
  - Asking or taking more loans/grants when asking for lab equipment. Making sure that all the technology is up to date and the collected data is backed. In-state staff can come to the lab and those out of the state can perform bioinformatics. If physicians are not able to come in because of schedule conflicts, we will have volunteers (undergraduate/graduate pre-medicine, nursing, PT, OT, etc).
- Sample Size
  - Starting the clinical trials smaller and as the participants grow as the phases become successful. Contracts with patients for the year-long project, plus only having local patients join the project.
- Time
  - Taking our time to make sure our experiment/project is successful. Contracts will be made with physicians/nurses and researchers to ensure a commitment is kept. Ensuring that there is more staff available to be recruited and assigning credits to college students (Notices must be given as the project progresses).
- Politics
  - Ensuring that politicians' and citizens that their safety is of top priority.

## **Public Health Initiative**

- Small scale

- Creating medications for families who have the physical appearance of Mochado's Disease using a biweekly appointment.
- Large scale
  - Sending the medications to other countries and families affects worldwide. Creating possible prenatal medications once the clinical trials have been passed. Going to the therapies for monthly checkups.

## ETHICS

- **Political/Economical Concerns**
  - Creating medications for families who have the physical appearance of Mochado's Disease using a biweekly appointment.
  - The political and economical benefits provided would give citizens the treatment first since a nation with less Mochado' Disease would be better off. The economy crashing would be a major concern at the local and worldwide levels, affecting all classes of people in society. Shipment delays would occur due to the economic depression that would sprout from the affected populace. The repercussions of treatment handling would include groups of people going against the government, the following would result from insufficiency or absence of the treatment, creating distrust amongst neighboring countries, and potential biological warfare.
  - To prevent any issues with the above-mentioned circumstances, all countries will be provided with factional data to earn the trust of their citizens. Medical centers holding treatment and access to therapeutics will be placed throughout the country and made accessible through various methods of transport. Availability for treatment would be shared with neighboring countries to avoid conflict. Furthermore, once treatment was administered to enough of the population, the economy would be restored through taxation and programs centered toward afflicted families in the middle and lower class to rebuild society once again.

## BENEFITS & DRAWBACKS

- **BENEFITS**
  - Disease effects will be lessened or stopped altogether until further development for a cure can be made. Animal models will demonstrate the positive and negative effects of the clinical trials.
- **DRAWBACKS**
  - Budget costs may restrict the scientists from proceeding with further research. Legal complications may prevent participants from joining the project, and written contracts with physicians may take even longer.

## ○ **ASPECTS**

- Differential methods for collecting medical surveys, effective planning, and unbiasedness with participants. This research will help in the comprehension of the pharmacological results. The target age ranges for clinical and non-clinical medicine will be pediatric, adolescent, adult, and elderly populace.

## ○ **ACCESSIBILITY TO PEOPLE**

- This is going to be financially accessible to many people. Mothers will be provided with regular check-ups with a healthcare provider, access to medication to manage their symptoms, and mental health support to cope with the emotional toll of their illness. For children, medication will be given as well as regular visits with a physical specialist, or occupational therapist. Additionally, both men and women have access to medical clinics for both therapy and medication options. The aim of this project is to improve the quality of life and ensure the survival of mothers and their newborns.
- Families, especially mothers, may feel guilty or blame themselves for passing on a genetic neurodegenerative disease to their children. Some women may not know they are pregnant and miss out on crucial prenatal care. Education and healthcare workers will also be impacted as they will need to be prepared to care for children with potential lifelong effects of Mochado's Disease.
- Project staff (inside and outside the lab) and healthcare workers will be provided benefits.

## ○ **MITIGATING RISK**

- The development of medication and testing on animal models will prioritize ethics, which includes ensuring the rights of animals are respected. The team will also focus on minimizing potential and adverse effects through various therapies.

## ○ **RESPONSE CONCERS**

- Budget costs may restrict the scientists from proceeding with further research. Legal complications may prevent participants from joining the project, and written contracts with physicians may take even longer.
- The introduction of new medications and therapies may raise concerns among the public due to potential side effects and limited knowledge of treatments. However, as patients show physical improvement, the public may become more accepting of the therapies. Though, conflict may arise, such as resistance from some families to allow strangers into their homes for treatment.
- Political reactions, such as negotiating agreements with world leaders to ensure the safety of their citizens are a top priority. Some leaders may feel that their citizens; safety is not a top priority, while others may be supportive of the project's goal to save lives globally.

# **REFERENCES:**

- "Alzheimer's Disease." *Mayo Clinic*. Mayo Clinic, 02 Feb. 2023. Web. 04 Apr. 2023. <<https://www.mayoclinic.org/diseases-conditions/alzheimers-disease/symptoms-causes/syc-20350447>>.
- "Lewy Body Disease: Dementia Society of America®." *Dementia Society*. Dementia Society. Web. 21 Apr. 2023. <<https://www.dementiasociety.org/lewy-body-dementia?msclkid=a4d6a96c81b611260505cd2ea8c13fc3>>.
- "Lewy Body Dementia." *Mayo Clinic*. Mayo Foundation for Medical Education and Research, 08 June 2021. Web. 23 Apr. 2023. <<https://www.mayoclinic.org/diseases-conditions/lewy-body-dementia/symptoms-causes/syc-20352025>>.
- "Parkinson's Disease." *Mayo Clinic*. Mayo Clinic, 17 Feb. 2023. Web. 03 Apr. 2023. <<https://www.mayoclinic.org/diseases-conditions/parkinsons-disease/symptoms-causes/syc-20376055>>.
- Eicher, Tanja Patricia, and M. Hasan Mohajeri. "Overlapping Mechanisms of Action of Brain-active Bacteria and Bacterial Metabolites in the Pathogenesis of Common Brain Diseases." *Nutrients* 14.13 (2022): 1-51. Print.
- Heerema, Esther, and Huma Sheikh. "Learn How Lewy Body Dementia Progresses after Diagnosis." *Verywell Health*. Verywell Health, 28 Sept. 2022. Web. 12 Apr. 2023. <<https://www.verywellhealth.com/lewy-body-dementia-stages-progression-98735>>.
- ODA, Haruhiko, Yasuji YAMAMOTO, and Kiyoshi MAEDA. "Neuropsychological Profile of Dementia with Lewy Bodies." *Psychogeriatrics* 9.2 (2008): 85-90. Print.
- Olivola, Sara, Serena Xodo, Enrica Olivola, Fabiana Cecchini, Ambrogio Pietro Londero, and Lorenza Driul. "Parkinson's Disease in Pregnancy: A Case Report and Review of the Literature." *Front. Neurol* 10 (2020): 1-9. Print.
- Ruggiero, Rafael Naime, Matheus Teixeira Rossignoli, Danilo Benette Marques, Bruno Monteiro De Sousa, Rodrigo Neves Romcy-Pereira, Cleiton Lopes-Aguiar, and João Pereira Leite. "Neuromodulation of Hippocampal-prefrontal Cortical Synaptic Plasticity and Functional Connectivity: Implications for Neuropsychiatric Disorders." *Front. Cell. Neurosci* 15 (2021): 1-23. Print.
- Simon, David K., Caroline M. Tanner, and Patrik Brundin. "Parkinson Disease Epidemiology, Pathology, Genetics, and Pathophysiology." *Clin. Geriatr. Med* 36.1 (2020): 1-12. Print.
- Sirisilla, Shrutika. "How to Write Limitations of Research - Explanation with Examples." *Enago Academy*. Enago Academy, 06 Nov. 2022. Web. 22 Apr. 2023. <<https://www.enago.com/academy/limitations-of-research-study/>>.
- Taylor, John-Paul, Ian G. McKeith, David J. Burn, Brad F. Boeve, Daniel Weintraub, Claire Bamford, Louise M. Allan, Alan J. Thomas, and John T. O'Brien. "New Evidence on the Management of Lewy Body Dementia." *Lancet Neurol* 19.2 (2020): 157-69. Print.