Libyan International Medical University
Faculty of Basic Medical Science

Epidemiology of Parkinson's Disease

Submitted by: Noha Mohammed Anan. Third Year Student. Faculty of Basic Medical Science. Libyan International Medical University.

Supervisor: Sara El-megerhi

Date of submission: 14/6/2018

This report is submitted as an assignment in the third year of BMS.

Abstract:

Parkinson's disease is a chronic neurodegenerative disease that is characterized by three main motor features: rest tremor, bradykinesia and muscular rigidity. These symptoms are due to the loss of dopaminergic neurons in the substantia nigra which leads to decreased levels of dopamine in the striatum negatively affecting the motor control. Other features include hyposmia and constipation.

PD is also characterized by presence of Lewy bodies in the substantia nigra. Its incidence increases with age and is more common in men. A cure hasn't been found yet; but improvement of motor functions is possible.

Introduction:

Parkinson's disease is a chronic, progressive neurodegenerative disease that is characterized by both motor and non-motor features. It is the most common cause of parkinsonism- a term used to describe the motor symptoms. Parkinsonism can be caused by other diseases or can be drug-induced. PD is the second most common neurodegenerative disease after Alzheimer's disease and its prevalence is estimated between 100 and 300/100,000.

The cardinal signs of PD are rest tremor, bradykinesia (slowness of movement) and muscular rigidity; often referred to as the classical triad. Both rigidity and bradykinesia occur in more than 80% of patients; while tremor occurs in 70-90% of patients and primarily involves the hands. Another feature; called postural instability, occurs in 50% of patients. These symptoms are due to progressive degeneration of dopaminergic neurons in the substantia nigra, leading to the loss of dopaminergic function.

Loss of dopamine affects the internal globus pallidal segment of the ventral striatum (GPi) and the pars reticulata portion of the substantia nigra (SNpr) leading to an increased activity in the GPi/SNpr circuits and eventual dysfunction of gamma aminobutyric acid (GABA), which leads to inhibition of the thalamus. When the thalamus is unable to activate the frontal cortical area; motor activity is affected.

The onset of motor features is only after 50% to 80% of dopaminergic neurons have been damaged. Non-motor symptoms such as sleep disorders, depression, and cognitive changes are often present before the onset of PD.

One major histopathological character is the presence of Lewy bodies in dopaminergic neurons in the substantia nigra. LBs are defined as intracellular cytoplasmic aggregates composed of proteins and lipids.

A cure is yet to be found; but some drugs can be effective in controlling the motor and non-motor symptoms and improving the quality of life. Other drugs –like antipsychotics- should be avoided; physiotherapy is recommended as it improves the motor function.[1]

Discussion:

PD is rare before the age of 50, it's incidence between ages 50-59 is 107/100,000 persons rises to 1087/100,000 persons between 70 to 79 years. It's more common in males with a ratio of 3:2. The delayed onset in females is due to the neuroprotective role of estrogen.

Regarding its prognosis; the rate of mortality was found higher in PD. Younger patients had a higher risk than the older ones.

The leading causes of death include heart disease and stroke. Studies have shown that 4% of PD patients develop dementia; especially those who are older and with greater severity of the disease.

Several studies were conducted to assist the relationship between PD and smoking. A meta-analysis found a 60% lower PD risk among smokers. Another meta-analysis found a 30% lower risk among coffee drinkers. One study showed that the risk is decreased by 40% among those who drank more than three cups of coffee per day. People who are exposed to pesticides –like farmers- had a 1.6 higher risk of developing PD. Head injury is suspected as a risk factor.[2]

A meta-analysis that included 332 publications to observe the prevalence of non-motor symptoms in PD found the following: hyposmia (diminished sense of smell) was the most prevalent (75.5% in cases vs. 19.1% in controls), followed by constipation (50% vs. 17.7%), anxiety (39.9% vs. 19.1%), rapid eye movement sleep behavior disorder (37.0% vs. 7.0%), depression (36.6% vs. 14.9%), and excessive daytime sleepiness (33.9% vs. 10.5%).[3]

A meta-analysis that included twenty-seven studies from 2001 to 2014 showed an increase in PD incident in recent years. Men had a higher incidence than females.

The overall incidence rate of PD in females 40 years and older was 37.55 per 100,000 person and 61.21 in males 40 years and older.

In females, incidence rates increased from 3.26 per 100000 persons at age 40-49 to 103.48 at age over 80. In males, incidence rates rose from 3.57 per 100000 persons at age 40-49 to 258.47 at age over 80.[4]

Further evidence that PD risk increases with age is a study in the US that found a mean annual incidence of 124.22 per 100000 among the 65-69 age group, 553.21 per 100000 persons among the 75-79 age group and 970.19 per 100000 among those older than 85 years old. It was also more common among white people.[5]

A study in Egypt was carried out with thirty-nine patients who were diagnosed with parkinsonism; thirty-three of these had PD, with a mean age of 66.9 years.

Men had a higher incidence than females, although the difference was not significant.

The clinical features of the patients were characterized by a high prevalence of mood/cognition dysfunction.[6]

Different studies estimated the prevalence rates of idiopathic PD in Arab countries; they were reported as the following: 27 per 100000 in Saudi Arabia. One study conducted in Jordan, reported prevalence of 37.4 per 100000; a Libyan study reported a prevalence rate of 31.4 per 100,000; a Tunisian study reported a prevalence of 43 per 100000. On the other hand, a study in Egypt found a PD prevalence of 557.4 per 100000; a rate much higher than the ones previously observed in the Arab world.[7]

Another study that took place between 1976 and 2005 in the US and included 906 cases of parkinsonism; it showed higher incidence in men across all three decades. The prevalence increased in men from 38.8 cases per 100000 person-years in the decade

1976-1985 to 56.0 in the decade 1996-2005, the incident rates were more stable in women over the thirty years period.[8]

Conclusion:

Parkinson's disease is a neurodegenerative disease that its onset increases with age, especially in those over 60. The last decades has found it to be increasing in incidence. It is especially more common in men.

References:

[1] DeMaagd G, Philip A. Parkinson's Disease and Its Management: Part 1: Disease Entity, Risk Factors, Pathophysiology, Clinical Presentation, and Diagnosis. Pharmacy and Therapeutics. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4517533/ 2015;40(8):504-532. Accessed June 13, 2018

[2] Elbaz A, Carcaillon L, Kab S, Moisan F. Epidemiology of Parkinson's disease. Science Direct. https://www.sciencedirect.com/science/article/pii/S0035378715009224 2016 Jan;172(1):14-26 Accessed June 13, 2018.

[3] Chen H, Zhao E, Zhang W, Lu Y, Liu R. Meta-analyses on prevalence of selected Parkinson's nonmotor symptoms before and after diagnosis. 8(1)2015. https://translationalneurodegeneration.biomedcentral.com/articles/10.1186/2047-9158-4-1 Accessed June 13, 2018

[4] Hirsch L, Jette N, Frolkis A, Steeves T, Pringsheim T, The Incidence of Parkinson's Disease: A Systematic Review and Meta-Analysis. Neuroepidemiology https://www.karger.com/Article/FullText/445751 2016;46:292-300 Accessed June 13, 2018

[5] Wright Willis A, Evanoff BA, Lian M, Criswell SR, Racette BA. Geographic and Ethnic Variation in Parkinson Disease: A Population-Based Study of US Medicare Beneficiaries. Neuroepidemiology. 2010;34(3):143-151. doi:10.1159/000275491. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2865395/ Accessed June 13, 2018

[6] Khedr E, M, Al Attar G, S, Kandil M, R, Kamel N, F, Abo Elfetoh N, Ahmed M, A, Epidemiological Study and Clinical Profile of Parkinson's Disease in the Assiut Governorate, Egypt: A Community-Based Study. Neuroepidemiology https://www.karger.com/Article/Abstract/335701 2012;38:154-163 Accessed June 13, 2018

[7] Alamri Y, MacAskill M, Anderson T, Benamer H, Parkinson's Disease in the Gulf Countries: An Updated Review. Eur Neurol https://www.karger.com/Article/FullText/442283 2015;74:222-225 Accessed June 13, 2018

[8] Savica R, Grossardt BR, Bower JH, Ahlskog JE, Rocca WA. Time Trends in the Incidence of Parkinson's Disease: a 30-year Study. JAMA neurology. 2016;73(8):981- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5004732/ Accessed June 13, 2018