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Diagnosis of Parkinson's Disease in Epidemiological Research

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About the Study

Parkinson's disease is the most common movement disorder besides essential tremor and is the second most common neurodegenerative disease after Alzheimer disease. People above 65 years of age usually suffer from Parkinson's disease. The rising of elderly population globally will increase the burden of Parkinson's disease in near future. In the world's 10 most populous nations and Western Europe, it was estimated that subjects with Parkinson's disease will rise from 4.1 million to 4.6 million in 2005 by twice in 2030.

In recent years, several causative monogenic mutations have been detected for Parkinson's disease. However, these mutations likely account for only small proportion of Parkinson's disease cases. The exact pathogenic mechanisms responsible for the selective dopaminergic cell loss underlying Parkinson's disease are still not entirely understood. The mitochondrial dysfunction, oxidative stress, protein mishandling, etc. have central role in Parkinson's disease pathogenesis. Sporadic Parkinson's disease thus results from a complex interaction between various non-genetic factors and susceptibility genes. Insight into these non-genetic causes improves the understanding of the pathogenesis of the disease and develops effective therapeutic strategies. Thus, large, well-designed prospective population-based cohort studies are suited to examine the effects of multiple potential risk factors and their interactions as well as effects that develop over a long period of time.

Diagnosis of Parkinson's disease is based on history and clinical findings. A definite diagnosis is made by demonstrating histopathological findings in brain samples and thus possible only by postmortem examination. In spite of advancement in sophisticated imaging technique such as positron emission tomography and single photon emission computed tomography scanning, till date there is no reliable and easily applicable biological or imaging marker for the diagnosis of Parkinson's disease. Although these new diagnostic techniques are potentially useful to discriminate from other Parkinsonian syndromes, its role in epidemiological research is still limited. According to currently applied diagnostic criteria, the clinical syndrome of Parkinsonism is characterized by resting tremor, bradykinesia, rigidity and postural imbalance. It is diagnosed when at least three of these four cardinal signs are present. Secondary causes need to be excluded. e.g., use of antipsychotic medication, repeated stroke, head trauma, infections, metabolic causes, hydrocephalus and other neurodegenerative diseases that involve the nigrostriatal system. A single assessment is often not sufficient to make a diagnosis, although diagnosis of Parkinson's disease in epidemiological research is often based on a single assessment leading to possible misdiagnosis in many cases. This creates problem in epidemiological study unless prospective design is pursued.

In descriptive epidemiology, disease frequencies are described as prevalence and incidences. The prevalence means presence of a total number of diseased subjects in a population in a particular point of time/date or period prevalence meaning prevalence of the disease over a specified period of time. In degenerative disease, usually period prevalence is considered. The incidence means appearance of new patients in a population within a time period.

Although several prevalence and incidence studies on Parkinson's disease are available across the world, comparison becomes difficult due to differences in methodology; different time period of these studies; differences in case ascertainment strategies employed in these studies. Moreover, as the diagnosis is based on clinical assessments, frequency estimates, use of liberal criteria would result in higher frequency rates. Clinic-based or record-based studies from a hospital fail to include patients who have to seek medical attention. Thus, these studies give a lower estimate compared to door-to-door surveys. In various studies, crude estimates of the prevalence or incidence for an entire population or a section of the population above a certain age is described, whereas in some studies, age-standardized rate is necessary for comparison across countries and also continents.

The crude prevalence rate of Parkinson's disease in developed countries is now estimated to be 3 in 1000 of the general population. As Parkinson's disease is predominantly a disease of the elderly, it is rare below 50 years of age and the prevalence is about 10 per 100 the population above 60 years of age. Its frequencies increase with advancement of age. The door-to-door survey and screening of all persons in the same population resulted in higher rate of newly diagnosed cases.

One important reason for low frequencies of Parkinson's disease in some nations could be the screening questionnaire used in these studies, specifically not focused to elicit more detailed information of the symptoms of Parkinson's disease. Most of these studies had also looked into the prevalence of other neurological illnesses. A screening questionnaire for Parkinson's disease suited to their conditions which could be administered by non-medical persons was developed and since the sensitivity and specificity were high, it could be effectively used in developing countries for population-based surveys.