Epidemiology of Parkinson’s Disease and Movement Disorders in India: Problems and Possibilities

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Abstract

Improving economy and health in developing countries like India, has increased the life span and changed the emphasis from communicable to noncommunicable diseases. This is likely to increase the prevalence of movement disorders and, age-related diseases like Parkinson’s disease (PD). We review Indian epidemiological studies to describe: a) Prevalence of movement disorders, b) methodological issues and c) potential of epidemiological research in a country with multiple ethnic races and environmental risks for PD. Most Indian epidemiological studies do not specifically assess PD and figures are from studies evaluating all neurological diseases. Well-designed Indian studies on PD and essential tremors estimate prevalence rates in Parsis who are ethnically different from Indians. We compare Indian prevalence studies with other parts of the world to examine the role of ethnicity in PD. Lack of accurate epidemiological data on PD and movement disorders creates an urgent need for properly designed and conducted epidemiological studies in India. This will help find out their load, identify areas of focus, create public health policies for elderly Indians and, possibly, provide etiological clues to the pathogenesis of PD. ©

INTRODUCTION

Population of elderly Indians has increased from 5.6% (51 million) in 1961 to 7.1% (71 million) in 2001. This increasing life expectancy of Indians, in the last decade, is likely to result in an increase in age-related diseases like Parkinson and Alzheimer’s diseases. The elderly population in developing countries is predicted to increase by 200-280% compared with a mere 30-40% in the developed nations.1 Of the world’s 580 million elderly (>60 yrs), 355 million (61%) live in developing countries and, of these, 77 million (22% of total) live in India.2 Caring for this increasing elderly population can be challenging as 80% of elderly Indians live in rural areas, 73% are illiterates, 60% are women and 60% live below the poverty line.3

Neurological disorders cause significant morbidity, mortality, disability, socioeconomic losses and reduce the quality of life.4 Few Indian neuroepidemiological studies have estimated the load of neurological diseases.5-7 Nearly, 33 million Indians have neurological disorders and they occur twice as often in rural areas.8 There are few neurologists to handle this large neurologically ill Indians as there is one neurologist for 200,000 population against 8,000 in Italy and 18,000-50,000 in USA, and most neurologists (70-80%) work in urban areas.

Most Indian epidemiological data on movement disorders comes from studies assessing neurological disorders rather than specifically examining Parkinson’s disease (PD) or essential tremors. Here we critically review these epidemiological studies to know the prevalence of PD and other movement disorders in India and compare Indian data with other parts of the world to discuss possible reasons for differences between them.

Extents of the Problem:

Movement Disorders: (Table)

Movement disorders are common and account for 3-8% of neurological disorders with a crude prevalence rate varying between 31 (>60+yrs) to 45/100,000,9,10 and these are twice more frequent in rural India.9-11 In a hospital-based study, movement disorders formed 20% of neurological patients.12 Nearly 1/3rd of the 493 residents living in elderly homes of Bangalore city had movement disorders. Parkinsonism (24%) was the commonest, followed by essential tremors (4.5%) while other movement disorders were less common (4.2%).13 Parkinson’s disease (Table 1):

Epidemiological correlates of PD in the Indians are estimated from studies examining neurological disorders and they mainly focus on prevalence. The method to screen all disorders is similar and, possibly, there could be a bias in case identification. Bharucha et al specifically studied the prevalence of PD in the Parsi community and found rates varying between 6-328/105.14,15 Studies from non-Parsi

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communities show low prevalence rates of PD, varying from 14-41/105.6,14 PD forms 5-60% of total movement disorders with variations in geographical areas.10,11,17 PD was more prevalent in rural (41/105) than urban (14/105) population and was commoner among men.17 Age-specific rates increase from 28 (in 4th decade) to 573 per 105 in ninth decade.11,17

Among hospital-based series of 2,34,021 new patients, 27% had neurological disorders, of which 20% had movement disorders and PD was the third common neurological disorder and the commonest movement disorder (86.5%). 12 A study among residents living in elderly homes (age >60 years) in Bangalore, showed that 24% had parkinsonism, with PD being the commonest (71%) followed by drug-induced parkinsonism (2.5%), multiple system atrophy (2.5%), vascular parkinsonism (1.7%), progressive supranuclear palsy (0.8%) and unclassified (22%).13 Thus, despite methodological differences across various studies and in different settings, PD is a common neurological problem in India.

Prevalence rates are influenced by case screening diagnostic methods and determinants like literacy, culture and others. All Indian epidemiological studies have estimated prevalence rates of neurological illnesses using door-to-door survey; this is preferable in a country with varying levels of education and use of medical services. They also use different types of personnel for collecting information and in different geographical settings. Population was screened using WHO protocol for neurological disorders or its variation but the sensitivity, specificity and predictive value of which vary.16,18 On the contrary, Bharucha used a standardized questionnaire to screen PD.19

Literacy and language pose problems in screening, therefore if another individual responds for the affected person and their understanding of PD might influence prevalence rates. Thus, it is important to develop culturally suitable screening instruments, train personnel, and include locally relevant questions for detecting PD. We have recently modified the questionnaire developed by Tanner et al, to screen PD and have confirmed its use in India.20,21

Diagnosis of PD in population-based studies is another important issue and presence of at least two of the three cardinal features of PD resting tremor, bradykinesia, rigidity without other cause of Parkinsonism is acceptable.22 The BURN study had an operation manual and this and Bharucha’s study used a case definition for PD.14,16,23,24

Cause of PD:

Few analytical studies have examined causes for PD in India, they are dependent on an individual researcher’s interests and are undertaken in hospital settings on a small population. A recent hospital based case-control study identified male gender, family history of PD, depression (≥10yrs) and well water drinking (of ≥10yrs) as potential risks. These authors noted tobacco use for more than 20 yrs. and keeping pets as protective causes. A case-control study shows rural living is a risk factor for PD but this is possibly influenced by study designs as most Indians (72.2%) live in rural areas, drink well water and agriculture is their commonest occupation.8,17,25,29

Ethnicity and PD:

Bharucha et al noted that Parsis have an age-adjusted prevalence rate (APR) of PD similar to white Caucasians but this figure is two times higher than other Indian studies (Table 1).8,10,11,14 The study differs from other Indian studies in terms of an urban setting and includes an ethnically different population. While causes are unclear, genetic origin of Parsis may explain the strikingly higher prevalence of PD in them. Parsis in India are Zoroastrians who came to India 1200 years ago from Persia. Prevalence rates of neurological diseases like essential tremors and multiple sclerosis are high among Parsis and are similar to the Caucasians.30-32 Ethnically, Parsis are members of the Aryan or Indo-Germanic family.33 Higher prevalence of many disorders among Parsis is ascribed to high consanguinity

Table 1: Comparison of characteristics in prevalence studies on neurological disorders with data on movement disorders and PD from different parts of India

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Place</th>
<th>Population characteristics</th>
<th>Neurological Movement disorders N (CPR/105)</th>
<th>PD disorders N (CPR/105)</th>
<th>APR/105*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gourie-devi (1987)(9)</td>
<td>Gowribidanur, Karnataka</td>
<td>Semi urban</td>
<td>Mixed</td>
<td>228(1252)</td>
<td>6(33)</td>
</tr>
<tr>
<td>Bharucha (1988)(14)</td>
<td>Mumbai</td>
<td></td>
<td>Rural</td>
<td>569(1425)</td>
<td>18(45)</td>
</tr>
<tr>
<td>Kapoor (1989)(7)</td>
<td>Ballabgarh, South Delhi</td>
<td>Rural</td>
<td>Mostly Muslim</td>
<td>1118(7980)</td>
<td>NA</td>
</tr>
<tr>
<td>Razdan (1994)(46)</td>
<td>Bengal</td>
<td>Semi urban</td>
<td>Mixed</td>
<td>2213(4335)</td>
<td>221(433)</td>
</tr>
<tr>
<td>Gourie Devi (1999)(17)</td>
<td>Bangalore</td>
<td>Rural</td>
<td>Mostly Muslim</td>
<td>228(1252)</td>
<td>6(33)</td>
</tr>
<tr>
<td>Das (2003)(11)</td>
<td>Bengal</td>
<td>Urban and Rural</td>
<td>Mixed</td>
<td>228(1252)</td>
<td>6(33)</td>
</tr>
</tbody>
</table>

N= sample size, CPR= crude prevalence rate, APR= age- adjusted prevalence rate, NA= data not available
*Age Prevalence rate with reference to population data of the United States Census, 1970.
but this might not be true as consanguinity rates are similar to other Indians.\textsuperscript{34} Anglo-Indians, an admixed population of Europeans and Indians, have a 5-times lower prevalence of PD than Indians (OR=4.8, 95% CI: 1.6 to 15.9). These studies highlight the role of ethnicity and PD, but this needs a well-planned and larger population based study.\textsuperscript{35}

Biological Differences

Biological differences exist between different populations suggesting a role of ethnicity in PD. Despite low prevalence of PD in the Indians, they have about 40% lower number of melanized neurons in the substantia nigra pars compacta than individuals from the United Kingdom.\textsuperscript{36} Lewy bodies occurring in normal individuals are called 'Incidental Lewy Body disease' (ILBD). Caucasians have higher prevalence rates (710%) of ILBD than non-Caucasians from Nigeria (5.3\%)\textsuperscript{35} and India 3.5\%.\textsuperscript{37,38} To explain these ethnic differences we proposed a “population genetic hypothesis” for PD.

Comparing prevalence studies from India (Table 1) and other parts of the world (Table 2) shows that PD is more prevalent in Caucasians than non-Caucasians; lower rates among non-whites (Saudi Arabia, China, Japan, African Americans and Indian non-Paris) compared with whites (US, Europe, Australia) could be because of differences in ethnic genetics. A recent study comparing prevalence rates of PD among the three Asian races (Malay, Chinese and Indians) living in Singapore and Chinese living in China showed rates comparable with the West.\textsuperscript{39,40}

Rheumatic Chorea:

Group B streptococcal infections are still common among children because of which rheumatic fever (RF) persists. Prevalence of rheumatic heart disease (RHD) varied from 1.8 to 11 per 1000 in the early period but, in recent years, this has reduced to 1 to 5.4 per 1000. Prevalence of rheumatic heart disease (RHD) varied from 1.8 to 11 per 1000 in the early period but, in recent years, this has reduced to 1 to 5.4 per 1000.\textsuperscript{41} Methodological issues might partly contribute, as prevalence of RF in school children has not reduced over a 20-year period.\textsuperscript{32} Nearly 10% of children after the first attack of Rheumatic fever develop chorea.\textsuperscript{43} Antistreptococcal prophylaxis is of proven value; correct and prompt treatment will help reduce the burden of rheumatic fever and its complications.\textsuperscript{44}

Essential Tremors:

Bharucha et al, examined 14,010 Parsis, an ethnic community, in urban Bombay using a door-to-door survey and estimated the prevalence of essential tremors to be 1.67 per 100,000 population that increased with age.\textsuperscript{30}

Future Perspectives:

The present review highlights that though PD and movement disorders are important public health problems in India, their magnitude (prevalence, incidence, causes) is not estimated. This is a major barrier to organize and deliver need-based services in India and other low and middle income countries. Problems about definition of movement disorders, screening techniques, diagnostic evaluation methods because of limited personnel are some of the major challenges to overcome. In addition, multiple spoken languages, low levels of literacy, poor use of services and several others pose problems for organizing epidemiological studies. The use of a validated screening instrument is a solution for conducting epidemiological studies of PD and this can help in uniformly assessing PD.\textsuperscript{21} The three-step method in which the final case ascertainment of PD is by a movement disorder neurologist would improve the accuracy and will improve case ascertainment.\textsuperscript{45} Well designed, focused and population representative studies will help find out social, infective, environmental and genetic causes and can help plan intervention studies. Assessment of socioeconomic burden, quality of life, and emotional burden on family members of PD in India would help understand the problems and plan supportive care to the elderly Indian population. If PD patients need to be adequately cared for, an investment in research and sustainable policies and programs with adequate funding and workforce is essential. Setting up Parkinson's disease registries in institutions with expertise and experience covering defined populations could be the first step in this

<table>
<thead>
<tr>
<th>Country</th>
<th>CPR</th>
<th>CPR (Standardized)</th>
</tr>
</thead>
<tbody>
<tr>
<td>France (47-49)</td>
<td>121-1470</td>
<td>34.05 - 413.6</td>
</tr>
<tr>
<td>Germany (50-52)</td>
<td>713 - 556,506</td>
<td>200.65 - 3517.78</td>
</tr>
<tr>
<td>Italy (45;53-58)</td>
<td>1.5% - 229.3</td>
<td>42.86-422.13</td>
</tr>
<tr>
<td>Mediterranean (59-61)</td>
<td>70.6 - 1400</td>
<td>19.87 - 21.95</td>
</tr>
<tr>
<td>Netherlands (62;63)</td>
<td>1300-1400</td>
<td>365.85-393.99</td>
</tr>
<tr>
<td>Portugal (64)</td>
<td>130</td>
<td>36.58</td>
</tr>
<tr>
<td>Spain (65-69)</td>
<td>161.5-1500</td>
<td>45.45-422.13</td>
</tr>
<tr>
<td>Sweden (70)</td>
<td>115</td>
<td>32.36</td>
</tr>
<tr>
<td>United Kingdom (71-75)</td>
<td>128-164.2</td>
<td>30.51 - 46.21</td>
</tr>
<tr>
<td>Bulgaria (76;77)</td>
<td>164.2 &amp; 169.8</td>
<td>46.21 &amp; 47.79</td>
</tr>
</tbody>
</table>

CPR= Crude Prevalence Rate; CPR (Standardized)= Crude Prevalence Rate standardized to population data of the United States Census, 2000.
direction. This epidemiological approach will help us focus and direct care for the increasing number of age-related neurological diseases and this investment is important.

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Announcement

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