Prevalence of Parkinson’s disease and other types of parkinsonism in the Aeolian Archipelago, Sicily

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Abstract

Objective: To estimate prevalence of Parkinson’s disease (PD) and other types of parkinsonism in the Aeolian Archipelago, Sicily.

Methods: We studied the frequency of PD and other types of parkinsonism in the Aeolian Archipelago (population 13,431). All potential cases were identified from available medical information sources. To ensure the completeness of the case-findings, a screening questionnaire was also mailed to residents aged 40 years and over. Subjects were considered prevalent if they fulfilled the SNES diagnostic criteria for PD, on prevalence day (January 1, 2001).

Results: We identified 17 patients with parkinsonism from medical sources, and 4 from mail-survey. Prevalence for all types of parkinsonism was 156.3/100,000 (95% CI 99.4–234.8). Fourteen subjects fulfilled diagnostic criteria for PD giving a crude prevalence of 104.2/100,000 (95% CI 59.4–170.7) and 422.5/100,000 in the population aged 60 years and over.

Conclusions: Prevalence of all types of parkinsonism and PD found in the Aeolian Archipelago is lower than that previously reported in Sicily.

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1. Introduction

Parkinson’s disease (PD) is the second most common neurodegenerative disorder after Alzheimer’s disease occurring worldwide, and in all ethnic groups. It is clinically characterized by parkinsonism, and pathologically by the loss of neurons in the substantia nigra. After the identification of monogenic familial parkinsonism, the importance of genetic factors in the pathogenesis of PD has recently gained weight. However, inherited forms explain only a small proportion of all PD, while nearly 90% of cases are apparently sporadic probably due to a complex interaction between genetic and environmental factors [1].

The prevalence of PD in industrialised countries is generally estimated at 0.3% of the entire population and about 1% in people over 60 years of age [1]. Epidemiological surveys carried out in Europe to determine the prevalence of PD generally showed a wide variation ranging from 65 to 257 per 100,000 [2], the highest prevalence being estimated in Italy by a large door-to-door survey carried out in three Sicilian communities (Santa Teresa Riva [Messina province], Riposto [Catania province] and Terrasini [Palermo province]), the Sicilian Neuroepidemiological Study (SNES study) [3]. Though estimates may vary according to different study
designs, diagnostic criteria, and case-finding methods, differences across populations might reflect differences in environmental exposures or distribution of susceptibility genes.

The different environments that characterize the small islands constituting the Aeolian Archipelago, together with the different ways of life of its inhabitants, prompted us to carry out an epidemiological survey to estimate the prevalence of all types of parkinsonism and PD in the Sicilian Aeolian Archipelago. Case-finding was based on the extensive revision of all available medical sources, and in order to detect previously undiagnosed cases, we also carried out a mail-survey in the population aged 40 years and above.

2. Materials and methods

2.1. Study area

The Aeolian Archipelago, part of the province of Messina, is located in the northern Tyrrhenian sea of Sicily. It is made up of seven small islands of volcanic origin and covers a total of 115 km² forming an arc over 70 km long. The inhabitants are all natives to the area. According to the 2001 national census [4], the total population of 13,431 inhabitants had not changed significantly in the last 10 years (12,783 as reported in the 1991 census) [5]. The climate is typical of the Mediterranean; economic level is generally low, mainly based on tourism and pumice stone extraction. Agriculture and fishing activities are marginal but the Aeolian population enjoys a fish rich diet and they fish for personal consumption. The study was approved by the local ethics committee.

2.2. Case ascertainment

In the present survey we used different kinds of case ascertainment. Parkinsonian patients were identified through different medical sources: revision of the archives of the public health services (hospital archives, general practitioners [GPs] rosters), private neurologists and collection of data on levodopa-containing drugs, dopamine-agonists and other types of antiparkinsonian drugs from the pharmacies. Furthermore, to ensure the completeness of the case-finding, a mail-survey was also carried out in the population aged 40 years and over.

2.3. Medical sources

In the Aeolian Archipelago, health care is provided by the local National Health Service unit through 11 GPs, 11 first-aid stations, 1 general hospital, and a neurological outpatient clinic. The local GPs are responsible for primary care, drug dispensing, and hospital admission. No neurologists are in private practice. No special neurological tools are available (i.e. EEG, CT, MRI) and geographical constraints limit the possibility of using medical facilities outside the area of residence. The nearest referral centres are on the North-Eastern Sicilian coast, in the province of Messina, and include the Neurological Departments of the General Hospitals in Milazzo and Messina, and the University Hospital of Messina, where diagnostic tools such as neurophysiology, neuroimaging (CT scan MRI, SPECT) are available.

The current study was performed by a team of four neurologists who underwent specific training before the beginning of the survey. They held preliminary meetings with the GPs to illustrate the design, aim of the study, and the diagnostic criteria. All medical information sources including the archives of the general and university hospitals, the centres for movement disorders present in Lipari, Milazzo, and Messina, were revised to identify possible parkinsonian patients. Furthermore, data were collected from all pharmacies on the archipelago on patients who were prescribed antiparkinsonian drugs, during the six months before the prevalence day (January 1, 2001).

To confirm the diagnosis, all established or suspected parkinsonian patients identified from the different medical sources were evaluated by the trained neurologists, in the local outpatient services, with the support of referring GPs. Institutionalized patients or those with severe physical and/or psychiatric disabilities were examined at their homes. For each patient an ad hoc questionnaire was completed to record demographic data, clinical findings, previous investigations, therapy and outcome. Medical records and all other available medical documents were reviewed by the whole investigation group.

2.4. Mail-survey

In addition, in order to identify undiagnosed subjects, a screening questionnaire was mailed, using stamped return envelopes, to all residents aged 40 years and over. The mailed questionnaire consisted of five specific items for parkinsonism. The questions included in the screening questionnaire were the same already adopted and validated in the SNES survey, showing a sensitivity of 100% and a specificity of 86% for parkinsonism [6].

In order to increase the participation rate a high level of co-operation was required. Local radio and television were used to inform and to sensitize the populations about the survey; meetings with the local GPs were regularly held. Furthermore, to increase the response rate for the mail-survey, three weeks after the questionnaire’s shipment, with the collaboration of the local GPs, when possible, subjects were contacted by phone.

2.5. Diagnostic criteria

Prevalence was based on the number of patients who were living in the study area on prevalence day, January 1, 2001, and fulfilled the diagnostic criteria of PD while living there. To allow comparison, PD and other types of parkinsonism were diagnosed according to the same criteria adopted in the SNES study [3]. The onset of PD was defined as the year when one of the cardinal signs was first noted. Crude prevalence rate was age-adjusted to the Italian population (national census 2001) [4]. Confidence intervals for estimates were also calculated. Furthermore, to allow comparison, we also estimated the expected number of cases in the Aeolian population and the Standardized Prevalence Ratio (SPR) by the indirect method of standardization using, as standard, the age-specific rates found in Santa Teresa Riva (province of Messina) during the SNES survey [3]. Among the communities of the SNES survey, Santa Teresa Riva, is the nearest to the Aeolian Archipelago.

3. Results

3.1. Prevalence of PD and parkinsonism in the Aeolian Archipelago

At the end of the survey from the medical sources, we identified 19 subjects with suspected parkinsonism. Out of the 19 subjects identified only 2 were exclusively traced from the antiparkinsonian drugs prescription. These subjects were taking anticholinergic drugs along with neuroleptics and both subjects were excluded in phase II because they were affected by psychiatric disorders. On the other hand, patients who were taking antiparkinsonian treatment identified through the pharmacies were also traced from the local GP’s roster.

Regarding the mail-survey, the population aged 40 years and above resident in the study area at the prevalence day consisted of 6494 inhabitants, 75.4% of whom returned the stamped envelopes (4896 residents). Out of the 4896 screened subjects, 210 (4.2%) were positive at the questionnaire and they underwent a complete neurological examination. A diagnosis of parkinsonism was confirmed in four patients. They were newly diagnosed patients. The steps we followed are shown in the flow chart (Fig. 1).

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At the end of the survey we identified 21 patients (17 from the medical sources and 4 from the mail-survey) who fulfilled the diagnostic criteria for PD and other types of parkinsonism on prevalence day, resulting in a prevalence of all types of parkinsonism of 156.3/100,000 (95% CI 99.4–234.8) and in the population aged 40 years and above, of 323.4/100,000 (95% CI 205.6–485.5). Prevalence was slightly higher in men (162.5/100,000; 95% CI 85.5–267.4) than in women (150.1/100,000; 95% CI 76.3–267.4), and steeply increased, in both sexes, with increasing age, reaching a peak of 1.166/100,000 in the population aged 80–89.

Out of the 21 parkinsonian patients, 14 fulfilled the diagnostic criteria for PD, 3 cases were affected by vascular parkinsonism, 2 by drug-induced parkinsonism and 2 were unclassifiable. Considering PD (14 subjects), the crude prevalence rate was 104.2/100,000 (95% CI 59.4–170.7) and in the population aged 40 years and above, 215.6/100,000 (95% CI 122.8–352.9). In the population aged 60 years and above, the prevalence was 422.5/100,000. Age-adjusted prevalence, using 2001 census for Italian population, was 151.7/100,000. Prevalence of PD steeply increased, in both sexes, with increasing age, reaching a peak of 1.166/100,000 in the population aged 80–89. Age- and sex-specific prevalence for PD is shown in Table 1.

3.2. Comparison of prevalence of PD and parkinsonism in Aeolian Archipelago and Santa Teresa Riva (SNES study)

During the SNES survey in Santa Teresa Riva (total population 6887 inhabitants on 1987), one of the communities of the SNES study, 23 patients affected by all types of parkinsonism were identified giving a crude prevalence for parkinsonism of 334.0/100,000 (95% CI 217–492) (unpublished data). Out of these 23 patients, 14 fulfilled the diagnostic criteria for PD giving a crude prevalence of 203.3/100,000 (95% CI 115.8–335.8). Four of the 23 parkinsonian patients were newly diagnosed patients (none were affected by PD). To allow comparison between these two populations (Santa Teresa Riva and the Aeolian populations, both located in the Messina province), we estimated the expected number of cases by the indirect method of standardization and using the age-specific rates found in Santa Teresa Riva as standard. The expected number of events in the Aeolian population for all types of parkinsonism was 47.5 (21 the observed) giving an SPR of 0.44 (95% CI 0.23–0.65). Furthermore, to take into account some possible dissimilarities related to the different study design (i.e. mail-survey vs. door-to-door design), SPR for all types of parkinsonism was also calculated excluding the newly diagnosed patients identified in both surveys (totally four parkinsonian patients in the SNES survey and also four patients in the present study identified by the mail-survey). When the newly diagnosed patients identified in both surveys were excluded, the expected number of events for all types of parkinsonism was 40.1 (observed 17) giving an SPR of 0.42 (95% CI 0.21–0.63).

Table 1

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Men</th>
<th>Women</th>
<th>Both sexes</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Cases</td>
<td>Population</td>
<td>Rate per 100,000</td>
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<tr>
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<td>//</td>
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<tr>
<td>40–49</td>
<td>0</td>
<td>1150</td>
<td>//</td>
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<tr>
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<td>//</td>
</tr>
<tr>
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<td>103.4</td>
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<td>3210</td>
<td>218.1</td>
</tr>
</tbody>
</table>

* Age-adjusted to the Italian population (2001 census).

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4. Discussion

A recent review of “high quality studies” of the last 20 years estimating prevalence of PD in Europe [2] reported prevalence rates ranging approximately from 108 to 257/100,000.

The highest prevalence reported (371.5/100,000 for all types of parkinsonism and 257.2/100,000 for PD) is from a large door-to-door neuroepidemiological survey carried out in Sicily (the Sicilian Neuroepidemiological Study, SNES) at the end of the 1980s. The aim of this study was to estimate the prevalence of the most common neurological disorders, including PD, in three Sicilian communities [3]. Prevalence rates of the current study conducted in the Aeolian population are lower than those reported in the SNES study, for either all types of parkinsonism or PD. The lower prevalence of PD compared to the SNES survey could be in part explained by differences in the study design. However, diagnostic criteria adopted were the same as those of the SNES study [3]. Although case ascertainment between the two studies was different, the mail-survey, ensuring the completeness of the case-finding, adopted the same questions specific for parkinsonism included in the SNES screening instrument. Mail-surveys generally achieve a lower response rate compared to the door-to-door surveys. However, in the current study we obtained a very high response rate (75.4%), close to that generally obtained by door-to-door surveys. Nevertheless, in this phase, we identified only four newly diagnosed cases (19%), a lower percentage compared with the SNES survey where 35% of the newly diagnosed patients were identified. Indeed, the SNES survey was performed more than 20 years ago, and one can plausibly suppose that the attentiveness of physicians to Parkinson’s disease has increased. Even if literature data have demonstrated that for health indicators and above all for chronic condition, there are not significant differences in the prevalence obtained by mail or face-to-face interview [7], we cannot exclude that a greater accuracy (and in turn an higher number of newly diagnosed patients) was obtained in SNES, where the face-to-face interviews were entirely performed by trained physicians. Differences in methods can explain only in part differences in prevalence rates between the two studies. Therefore, it is likely that prevalence of PD in Aeolian Archipelago is truly lower than that reported in the other Sicilian study [3]. Although, apparently, the two populations share the same environment and similar genetic background, some differences between life habits of residents of the small islands constituting the Aeolian Archipelago and the cities involved in the SNES study are still evident; for instance, the economy of the Aeolian islands is for the most part characterized by seasonal tourism and only marginally by agricultural and fishing activities. Industries or manufacture activities are completely absent. Moreover, the tendency to marry persons of the same community is quite frequent in population living in small and isolated places. This, in contrast to the large island of Sicily, could be the case of Aeolian Archipelago.

Cross-cultural variations in the prevalence of PD are potentially interesting from an aetiological point of view, as they might result from differences in environmental exposures or distribution of susceptibility genes and therefore the results of the current survey are a worthwhile premise for future analytic studies.

References