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The Incidence of Parkinson's Disease in the Netherlands: Results from a Longitudinal General Practice-Based Registration

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Parkinson's disease (PD) is a neurodegenerative disease with a prevalence of 100–200 cases per 100,000 persons in the general population [1]. The prevalence increases sharply with age, and most surveys show a slight male preponderance. Moreover, prevalence rates may vary depending on the geographical location and seem to be especially low in developing countries [1]. Although there are many studies assessing prevalence, *incidence* studies are scarce. A recent review of incidence studies of PD shows that out of 25 studies, only 8 were prospective in design, and only 2 had some sort of follow-up in order to confirm the diagnosis [2]. Reliable estimates of the incidence of PD are necessary for adequate planning of health care services. In this letter, the authors would like to report the incidence rates of PD in the Netherlands based on the analysis of data from an ongoing longitudinal general practice-based registration network.

Our analysis was performed with data from the Registration Network Family Practices [RegistratieNet Huisartspraktijken, (RNH)]. The RNH is a computerized database in which 53 general practitioners (GPs) working in 21 family practices in the south-east of the Netherlands participate [3]. The procedures of the RNH are in accordance with the Dutch civil law and patients are informed about the participation of their practice. They are given the possibility of opting out individually, without consequences for their medical care. Data are collected on all relevant current and past health problems. For this purpose, a 'health problem' is defined as 'anything that has required, does, or may require health care management and has affected or could significantly affect a person's physical or emotional well-being'. These problems are coded according to the International Classification of Primary Care (ICPC), using the criteria of the International Classification of Health Problems in Primary Care (ICHPPC-2) [4, 5]. The register is continuously updated with information from all possible sources, including correspondence, reports and investigations from hospital-based specialists. The RNH has been in operation since 1985, but in the early years, only a limited number of practices participated. Therefore, we confined our analysis to patients that participated in the RNH between 1990 and 2000 (inclusive), during which time the number of participating patients increased from 16,995 to 82,430, respectively. Participation in the RNH ends when a patient migrates to a non-participating practice or

Table 1. Average annual crude incidence of PD in the south-east of the Netherlands over the period from 1990 to 2000 (inclusive)

Age group years	Male	Female	Total
<40	1.1	–	0.5
40–49	0.6	–	0.3
50–59	21.5	10.7	16.1
60–69	24.7	47.9	39.2
70–79	158.4	126.6	134.0
80+	398.8	227.7	279.2
Overall	21.3	23.5	22.4

Incidence is defined here as the number of new cases per 100,000 RNH participants per year.

dies. With regard to demographic characteristics, the population is comparable with the regional Dutch population [6].

For the ICPC diagnosis of PD (ICPC code N87), all of the following criteria must be met: coarse tremor, improving with active purposeful movement, muscular rigidity and poverty of movements. Postural instability, one of the more widely used operational criteria for PD by the United Kingdom Parkinson's Disease Society Brain Bank (UK-PDS-BB), is not part of the ICHPPC-2 criteria [7]. Causes of parkinsonism other than PD have different ICPC codes and are not included in the analysis.

We calculated age- and sex-specific incidences using incident PD cases as the numerator and the total number of RNH participants as denominator. Incidence is defined here as the number of new cases per 100,000 participants per year. Excluded from the incidence cohort were patients with known PD on January 1, 1990. The denominator was corrected yearly by removal of incident cases of the last year. This study is purely descriptive, and no statistics were applied.

From 1990 to 2000 (inclusive), 139 new PD cases were identified. This number was large enough to allow calculation of the incidence for the population as a whole, as well as for subgroups characterised by age and sex. The overall crude incidence for the population was 22.4 per 100,000 per year [95% confidence interval (CI): 13.1–31.7]. Before the age of 50, PD is rare. The incidence increases exponentially with age, and keeps on increasing even in the highest age groups. The incidence in men is higher than that in women in all age groups, except in the 60- to 69-year-olds. The results are shown in table 1.

The overall annual incidence of 22.4 per 100,000 per year in our population is comparable with that of two other recent community studies [8, 9], but higher than that reported by most studies [2]. In order to check whether this higher incidence reflects the true incidence of PD in the Netherlands, it is necessary to assess the representativeness of the study population, the completeness of the registration, the adequacy of diagnosis, and the detection rate. Because almost all people in the Netherlands are registered with a general practice, the subjects included in our study form a largely unselected group and can be considered representative for the regional general population. The reliability and completeness of the registration have been determined earlier by comparison of the RNH data with disease-specific hospital-based registers, such as the regional Cancer Registry and the Maastricht Epilepsy Case Register [6, 10]. To ensure the quality of the RNH database, participating GPs receive regular instruction and training sessions and quality control interventions.

The diagnosis of PD was confirmed by a neurologist in 80.3%. Of the other 19.7%, 7.6% received the diagnosis 'parkinsonism', 6.1% did not receive a diagnosis, and the remaining 6.1% received another diagnosis [11]. Differences in detection strategies may be another potential explanation for the high incidence of PD in our study. Most incidence studies use various case finding strategies to estimate the (point) prevalence of PD in a population, and calculate incidence rates by retrospective estimation of disease duration, based on examination of medical records or the patients' history. In spite of sometimes intensive efforts, the case-finding strategies in these studies may not reveal all cases and thus lead to underestimation. Moreover, estimation of disease duration may be hampered by incomplete record keeping or recollection bias. Because of the broader definition, it is theoretically possible that more patients would fulfil the ICHPPC-2 criteria than the more widely used UK-PD-BB criteria. The ICHPPC-2 criteria lack the 'postural instability' item as a major diagnostic criterion. In spite of these differences, the clinical correlates of these classifications are, in our view, highly comparable.

A detailed discussion of the advantages and limitations of register studies, as well as methodological issues specifically related to the RNH registration, is given by Leentjens et al. [11], as well as by Schuurman et al. [12].

Having addressed these issues, we think that our findings are an accurate reflection of the incidence of PD in the south-east of the Netherlands. Most *longitudinal* studies have reported higher incidences than studies that determine point prevalence followed by retrospective estimation of disease duration. Two longitudinal studies have focussed on the incidence of PD in *selected* populations, like elderly, or middle-aged men [13, 14]. These studies describe incidences that are comparable with ours in the corresponding age groups. One recent general practice-based longitudinal study also shows a higher incidence than those reported by earlier studies [9].

Although most studies report a male preponderance in the incidence of PD, a substantial minority of studies shows a female preponderance [2]. In our population, we found a slightly higher overall incidence in females, but this finding is entirely attributable to the high incidence in the female 60–69 age group. Although at first sight it seems tempting to ignore this finding, a higher incidence in women than in men for the age group of 65–74 has also been reported in the study by Mayeux et al. [9]. Women may have a later onset of the disease, but at the same time a higher increase in incidence as to 'catch up' with affected male numbers.

Apart from the sample size requirement, our study fulfills all of the quality criteria for incidence studies on PD, as described by

Twelves et al. [2], who report an average incidence of approximately 17 per 100,000 per year for the best incidence studies, but state that this figure may be an underestimate. Indeed, we find a higher average incidence of PD of 22.4 per 100,000 per year, which may be due to an intensive collection of information on all subjects of practices participating in the RNH, and the use of all available sources. As expected, the incidence of PD rises sharply with age, and keeps on increasing, even in the highest age group.

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