ELSEVIER

Clinical Neurology and Neurosurgery 104 (2002) 182–191

Clinical Neurology and Neurosurgery

www.elsevier.com/locate/clineuro

The worldwide prevalence of multiple sclerosis

Maura Pugliatti *, Stefano Sotgiu, Giulio Rosati

Institute of Clinical Neurology, University of Sassari, Viale San Pietro 10, 07100 Sassari, Italy

Keywords: Multiple sclerosis; Prevalence; World; Geography; Genetics; Environment

1. Introduction

Despite the wealth of epidemiological data deriving from the systematic studies of multiple sclerosis (MS) that have been carried out for over 70 years, any attempt at redefining the pattern of MS geographic distribution is still a difficult task. In fact, comparing prevalence studies of different areas and at different times implies a number of problems: (a) the variability of the surveyed populations in terms of size, age structure, ethnic origin and composition [1]; (b) the difference when determining the numerator, i.e. the recognition of benign and very early cases [2]; (c) the extent to which complete case ascertainment is achieved based on geographic and time variables, access to medical care, local medical expertise, number of neurologists, availability of and accessibility to new diagnostic procedures, degree of public awareness about MS, and on the investigators' zeal and resources [2,3]; (d) the use of different diagnostic criteria and the interobserver variability when applying them [1]. A description of MS geography worldwide is tentatively presented (for detailed references, see review by Rosati [4]).

2. Europe

The prevalence rates estimated for Scotland and its offshore islands over the last 25 years range from 145 to **193 per 100 000 and are the highest** so far detected anywhere in the world for large populations. In England and Wales, prevalence rates have varied from 74 to 112 in the last 15 years; 66 per 100 000 was the rate yielded by a nationwide survey in the Republic of Ireland in 1971, whereas a prevalence of 168 was estimated in northern Ireland. The highest frequencies of MS in the UK and mostly in Scotland support the hypothesis that the Scottish ancestry is associated with a high susceptibility to the disease, possibly on a genetic basis (Fig. 1).

A high risk for MS among Scandinavians is also well established although, it must be noted that the distribution of MS in Nordic countries is not homogeneous. In Norway there is a marked difference in MS risk between the northern Tröms and Finmark, with prevalence rates of 37 and 21 in 1983, and the southern Hordaland County and Oslo with rates of 75 and 132 in 1983 and in 1995, respectively. As a high proportion of the northernmost Norwegian populations are Samis, formerly known as Lapps, it is therefore likely that Samis are resistant to the disease. Gothenburg is the only area recently surveyed in Sweden based on a case register created in the early 1950s and updated in 1988, which yielded a rate of 96. The Danish nationwide prevalence of MS was updated in 1990 based on a case registry created in 1949, indicating a rate of 112. Danes, Norwegians and Swedes have an almost identical ethnic background, and may thus share a similar genetic susceptibility to the disease. The same ethnicity is also shared by the population of the Faroe Islands, which have been repeatedly assessed as to MS frequency by Kurtzke and Hyllested for almost 20 years. The most recent prevalence study [5] yields a rate of 66 per 100 000 in 1998. It has been claimed that MS appeared in the Faroes during the occupation by British troops in World War II and subsequently occurred in four separate epidemics, in support of the hypothesis that it is a widespread persistent asymptomatic infection. Being based on a small population and few cases, despite the Faroes' peculiar historical context and repeated surveys [6], the conclusion that MS is a transmissible disease somehow appears to be unwarranted [7,8]. The widespread asymptomatic illness that was then claimed as of infectious origin [6] may instead be viewed as a genetically based asymptomatic immune dysfunction which, when triggered by a non-specific viral infection [7,8], renders the general population at risk for devel-

* Corresponding author. Fax: +39-079-228423
E-mail address: maurap@uniss.it (M. Pugliatti).

migrated from Northern and Southern Europe at different ages may persist, influencing the reported rates; in New Zealand, the south-to-north gradient observed may actually be justified by the presence of Maori ancestry up to 50% of the whites living in the north. In Australia, however, the highest prevalence rates reported from originally British, Scottish and Irish communities do not exceed half the frequency observed in most parts of the British Isles, and suggest that the role of environment cannot be ignored. In fact, the influential migration studies in South Africa, Israel and among West Indians migrating to the UK indicate that MS prevalence can vary with place of residence early in life irrespective of genetic factors; thus, twin studies show that almost 60% of monozygotic twins are not concordant for MS. Given that the increased MS frequency reported from different regions is, at least in part, real, a change of environmental conditions in susceptible populations should be reasonably assumed, because the genetics of a population per se would shape the disease at a much slower pace. The geography of MS could therefore be viewed in terms of a discontinuous distribution of genetic alleles of susceptibility, conferring risks that are subsequently modified and influenced by environment.

Acknowledgements

Special thanks to Mr Corrado Occhineri for his technical support. This project received support from the Istituto Superiore di Sanità, Fondazione Italiana Sclerosi Multipla (Grant #R/69/97), the Ministero dell'Università e della Ricerca Scientifica e Tecnologica, and Regione Autonoma della Sardegna.

References

[1] Rosati G. Descriptive epidemiology of multiple sclerosis in Europe in the 1980s: a critical overview. Ann Neurol 1994;36(Suppl 2):S164–74.
[2] Sadovnick A, Ebers G. Epidemiology of multiple sclerosis: a critical overview. Can J Neurol Sci 1993;20:17–29.
[3] Noseworthy J, Lucchinetti C, Rodriguez M, Weinshenker B. Multiple sclerosis. N Engl J Med 2000;343:938–52.
[4] Rosati G. The prevalence of multiple sclerosis in the world: an update. Neurol Sci 2001;22:117–39.
[5] Kurtzke J, Heltberg A. Multiple sclerosis in the Faroe Islands: an epitome. J Clin Epidemiol 2001;54:1–22.
[6] Kurtzke J, Hyllested K. Validity of the epidemics of multiple sclerosis in the Faroe Islands. Neuroepidemiology 1988;7:190–227.
[7] Poser C, Hibberd P, Benedikz J, Gudmundsson G. Analysis of the 'epidemic' of multiple sclerosis in the Faroe Islands. I. Clinical and epidemiological aspects. Neuroepidemiology 1988;7:168–80.
[8] Poser C, Hibberd P. Analysis of the 'epidemic' of multiple sclerosis in the Faroe Islands. II. Biostatistical aspects. Neuroepidemiology 1988;7:181–9.
[9] Poser C. Multiple sclerosis. Observations and reflections—a personal memoir. J Neurol Sci 1992;107:127–40.
[10] Cavalli Sforza L, Menozzi P, Piazza A. Europa. In: Cavalli Sforza L, Menozzi P, Piazza A, editors. Storia e geografia dei geni umani. Milano: Adelphi Edizioni, 2000:512–7.
[11] Casula F. Introduzione. In: Casula F, editor. La Storia di Sardegna. Sassari: Carlo Delfino Editore, 1998:23–53.
[12] Songini M, Loche M, Muntoni S, Stabilini M, Coppola A, Dossi G, et al. Increasing prevalence of juvenile onset type 1 (insulin-dependent) diabetes mellitus in Sardinia: the military service approach. Diabetologia 1993;36:547–52.
[13] Muntoni S, Stabilini L, Stabilini M, mancosu G, Muntoni S. Steadily high IDDM incidence over 4 years in Sardinia. Diabetes Care 1995;18:1600–1.
[14] Frongia O, Mastinu F, Sechi G. Prevalence and 4-year incidence of insulin-dependent diabetes mellitus in the province of Oristano (Sardinia, Italy). Acta Diabetol 1997;34:199–205.
[15] Songini M, Bernardinelli L, Clayton D, Montomoli C, Pascutto C, Ghislandi M, et al. The Sardinian IDDM study: 1. Epidemiology and geographical distribution of IDDM in Sardinia during 1989–1994. Diabetologia 1989;41:221–7.