

Article abstract—For the present incidence study of multiple sclerosis (MS) in Finland, reliable data since 1964 were available. The mean annual incidence rate of MS was significantly higher in the western part (3.3 per 100,000) than in the southern part of the country (2.2 per 100,000). The mean annual incidence for all MS patients was highest during the second of the three 5-year periods from 1964 to 1978. However, the incidence for women in the western part increased also thereafter. At the same time, the female-to-male incidence ratio changed from 1.0 to 2.2. The results confirmed an uneven distribution with a stable cluster of MS in the western part of the country.

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Multiple sclerosis in Finland: Evidence of increasing frequency and uneven geographic distribution

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Finland lies between the 60°N and 70°N latitudes in northern Europe. The population is about 4,700,000. Intensive search of all cases of MS since 1964 has revealed a prevalence of about 50 per 100,000 population.¹ The prevalence of MS seems to have increased continuously. In 1979, the prevalence was three times higher than it had been 15 years earlier.^{2,3} In addition, MS seems to be unevenly distributed, with a cluster in the western part of the country.¹⁻³

Increased prevalence has also been noted in other countries where epidemiologic data have been available for a longer time.⁴⁻⁶ The increase has been attributed to more effective registration of cases as well as increased longevity of patients. However, there have been only a few incidence studies of MS, and most of them are retrospective. Moreover, many studies have not been restricted to definite MS cases.

Most incidence studies have demonstrated an unchanging rate in long-term or repeated studies.⁶⁻¹¹ However, in the Faeroe Islands, there was evidence of an epidemic of MS that followed occupation of the islands by British troops in World War II.¹² Evidence of a postwar epidemic from 1945 to 1954 was also found in Iceland.¹³ A study in Scotland indicated an increasing incidence for MS, but the data were mainly retrospective.¹⁴

The present study was done to determine the incidence of MS in Finland in reference to the increasing

prevalence figures and the uneven geographic distribution.

Materials and methods. There has been continuous registration of all Finnish MS patients since 1964. Data have been collected from registers of the National Board of Health, Social Insurance Institution, departments of neurology, psychiatry, and ophthalmology of the university and central hospitals, general hospitals, and health centers. All diagnoses of MS were confirmed by a neurologist. The data were based on definite MS cases that fulfilled the criteria of the Schumacher Committee,¹⁵ but some patients with onset of symptoms after age 50 were included. The medical records of every case were examined personally by the author.

Two separate geographic areas were selected for the present incidence study (figure 1). The southern province of Uusimaa is an area of medium prevalence risk for MS (52.1 per 100,000 population) and had a population of 1,111,566 on January 1, 1979. The western province of Vaasa, population of 428,082, was selected because the prevalence rate there is the highest in the country (92.9 per 100,000).¹ In addition, there are marked local variations in the prevalence of MS within this province.^{1,3}

The incidence of MS was calculated from first symptoms in 5-year periods between the years 1964

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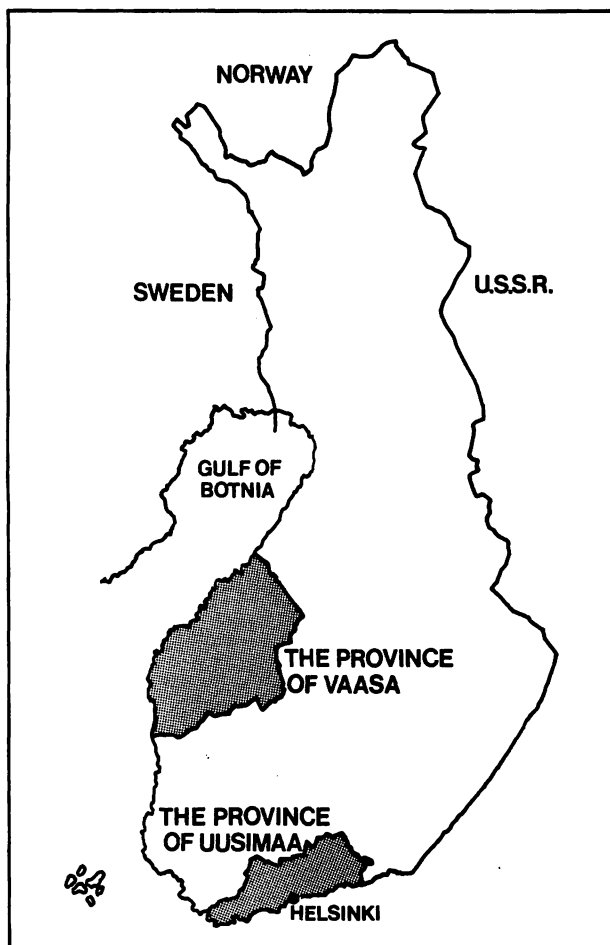


Figure 1. The map of Finland with the capital (Helsinki) and the two provinces, Uusimaa and Vaasa.

and 1978. The standard population for age and sex adjustment was the total population of Finland. The estimated mean populations in Uusimaa for the three periods 1964 to 1968, 1969 to 1973, and 1974 to 1978 were 944,613, 1,023,964, and 1,093,103, respectively. The corresponding numbers in Vaasa were 442,129, 422,940, and 424,613.

Student's *t* test was used for statistical comparisons between means of the incidence rates.

Results. General data. In Uusimaa, 337 new MS cases (112 men and 225 women) were registered with the onset of the disease in the years 1964 through 1978. The corresponding number was 211 (86 men and 125 women) in Vaasa. The mean age at onset of symptoms was 29.9 years in Uusimaa (30.1 for men and 29.8 for women) and 33.4 years in Vaasa (34.2 for men and 32.8 for women). The corresponding median ages were 28.5 years (29.5 and 27.2) in Uusimaa and 33.5 years (34.5 and 32.3) in Vaasa. The female-to-male ratio for the 15-year period was 2.0 in Uusimaa and 1.5 in Vaasa. The corresponding ratio for the estimated total mean population for this period was 1.1 in both provinces.

Table 1. Age and sex distribution of the patients in the provinces of Uusimaa and Vaasa at the onset of MS

Age (yr)	Males		Females		All cases	
	No.	%	No.	%	No.	%
Uusimaa						
10-19	8	7	22	10	30	9
20-29	51	46	111	49	162	48
30-39	37	33	58	26	95	28
40-49	15	13	30	13	45	13
50-59	1	1	4	2	5	1
Total	112	100	225	100	337	100
Vaasa						
10-19	4	5	6	5	10	5
20-29	24	28	49	39	73	35
30-39	29	34	41	33	70	33
40-49	24	28	23	18	47	22
50-59	5	6	6	5	11	5
Total	86	100	125	100	211	100

Age and sex distribution. The highest percentage of cases was found in the age group of 20 to 29 years, except among men in Vaasa, where patients aged 30 to 39 predominated (table 1). In Uusimaa, the disease began before age 30 in 57% of patients. This occurred in Vaasa in only 39% of cases. The youngest patient at onset was 11, and the oldest was 57.

Incidence of MS. In Uusimaa, the highest incidence (5.7 per 100,000) was in the age group from 20 to 29 (figure 2). In this group, the incidence for men was 3.7, and for women 7.6 per 100,000 population. In Vaasa, the incidence was highest in the age group from 30 to 39 (9.2 per 100,000). It was 7.5 for men and 10.9 for women.

The mean annual incidence rate for the 15-year period was 2.2 per 100,000 in Uusimaa and 3.3 per 100,000 in Vaasa. The difference was significant ($p < 0.01$). The annual incidence rates varied from 0.8 to 3.3 per 100,000 in Uusimaa and from 1.6 to 4.8 in Vaasa (table 2). The highest annual incidence rate was measured in Uusimaa in 1970 and in Vaasa in 1968.

The adjusted rates for the 5-year periods did not differ significantly from the specific rates (figure 3 and table 3). The adjusted mean annual rates were highest in the second 5-year period from 1969 to 1973 (2.5 in Uusimaa and 3.8 in Vaasa; $p < 0.05$). Only the adjusted incidence of women in Vaasa was higher in the last 5-year period, 1974 to 1978. In fact, the incidence for women increased steadily during the three periods—from 3.3 to 4.5 per 100,000—but the difference was not statistically significant. The adjusted incidence for men in Uusimaa remained stable in the first two 5-year periods and declined

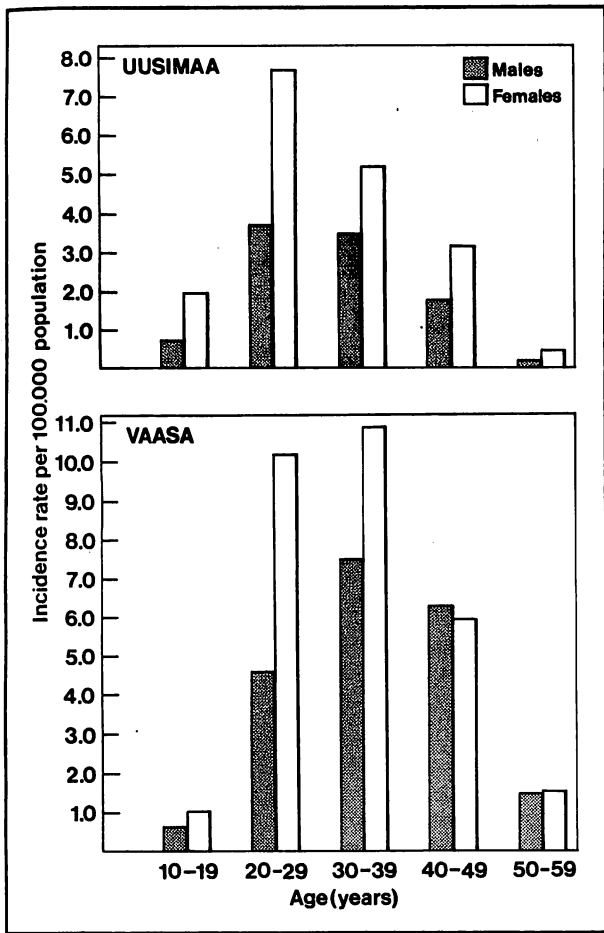


Figure 2. Age- and sex-specific incidence for MS in Uusimaa and Vaasa.

Table 2. The annual incidence rates of MS per 100,000 population from 1964 to 1978

Year	Uusimaa		Vaasa	
	New cases	Incidence	New cases	Incidence
1964	17	1.9	12	2.7
1965	21	2.3	9	2.0
1966	21	2.2	7	1.6
1967	18	1.9	20	4.5
1968	18	1.8	21	4.8
1969	30	3.0	18	4.2
1970	33	3.3	18	4.3
1971	32	3.1	15	3.6
1972	19	1.8	12	2.8
1973	24	2.3	13	3.1
1974	22	2.0	18	4.3
1975	30	2.7	14	3.3
1976	17	1.5	9	2.1
1977	26	2.4	17	4.0
1978	9	0.8	8	1.9
Mean annual incidence (\pm SD)		2.2 \pm 0.65		3.3 \pm 1.06

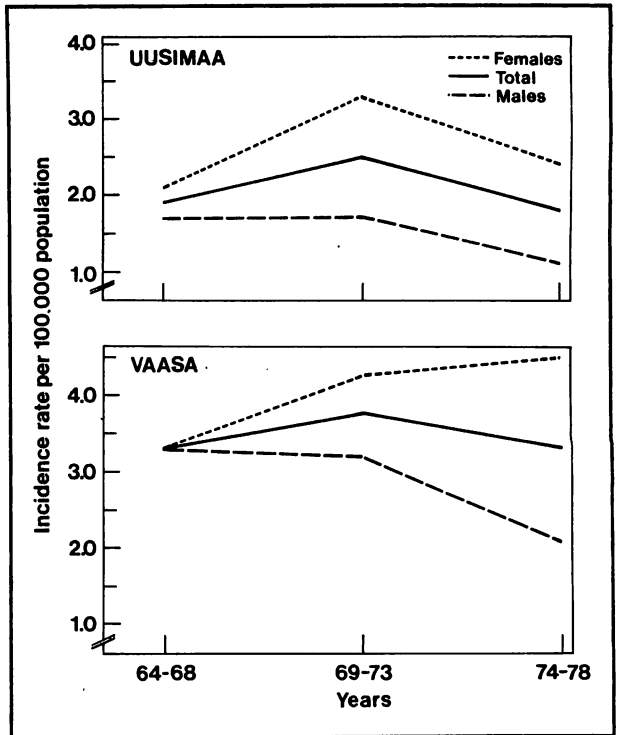


Figure 3. Age- and sex-adjusted incidence of MS per 100,000 population in 5-year periods from 1964 to 1978 for Uusimaa and Vaasa.

thereafter—from 1.8 to 1.2 per 100,000. The corresponding incidence curve for men in Vaasa was similar, with the rates 3.2, 3.1, and 1.9, respectively. The adjusted incidence rates for women in Uusimaa were similar to the total rates. The mean annual rate from 1964 to 1968 was 2.2 and increased to 3.5 ($p < 0.05$) within the following 5 years. Thereafter, the mean annual rate was 2.5, which is almost the same as that in the first registration period.

Initial signs and symptoms. The disease most often started with sensory (from 33 to 34%) and pyramidal tract (from 33 to 36%) symptoms and signs (table 4). Optic neuritis was the first sign in 23 to 26% of cases. The distribution of the presenting symptoms did not differ significantly in the two provinces.

Discussion. The epidemiology of MS in Finland has been investigated for almost 20 years. Reliable prevalence data are available since 1964, and they formed the background for the collection of incidence data in the present study. Due to the continuous search for new cases for a sufficiently long period of time, it has been possible to collect a large series and also to include mild cases.

Two geographic areas were selected for this study. They differ in several ways. Uusimaa is industrial and has a heterogeneous population originating from all parts of the country. Vaasa is an agricultural region where the population has been stable for hun-

Table 3. The mean annual incidence rates of MS per 100,000 population in 5-year periods from 1964 to 1978

Period	Males	Females	Total
Uusimaa			
1964-1968	1.8	2.2	2.0
1969-1973	1.8	3.5	2.7
1974-1978	1.2	2.5	1.9
Vaasa			
1964-1968	3.2	3.1	3.1
1969-1973	3.1	4.1	3.6
1974-1978	1.9	4.2	3.1

Table 4. The initial symptoms and signs of MS

Symptom	Uusimaa		Vaasa	
	No.	%	No.	%
Optic neuritis	89	26	48	23
Diplopia (III, IV, and VI cranial nerves)	36	11	29	14
V or VII cranial nerves	13	4	7	3
Pyramidal tract (paresis or spasticity)	112	33	75	36
Sensory	116	34	70	33
Brainstem or cerebellum	83	25	62	29
Spinal	34	10	9	4
Autonomic	20	6	5	2
Miscellaneous	25	7	14	7

dreds of years. Migration into the province has always been sparse, and emigration has also been insignificant, except at the beginning of this century, when many people emigrated to North America. In the present study, more than 90% of the MS patients in Vaasa were also born there, whereas the corresponding rate in Uusimaa was significantly lower (49%).

Comparison of incidence data in these two provinces showed differences. The most important one was the significantly higher mean annual incidence rate of MS in Vaasa (3.3 per 100,000) than in Uusimaa (2.2 per 100,000). This is in agreement with the previous prevalence data.^{1,3} The mean age at onset of symptoms was slightly higher in Vaasa (33.4 years) than in Uusimaa (29.9 years). The median ages did not differ significantly from these. Elsewhere, the first symptoms most often occur at about age 30,^{6,13} although onset ages like that in

Vaasa have also been recorded.^{5,16,17} Patients in Uusimaa live in an urban area and may come sooner for a neurologic examination than patients in Vaasa. The percentage of MS patients aged 20 to 29 was low in Vaasa, especially for men. This difference may reflect the emigration of young people, especially men, from Vaasa to the southern industrial parts of the country. This is in agreement with the difference seen in age adjustment in these two parts of the country. These differences do not account for the uneven geographic distribution of MS in the country. The unusually high incidence of MS in the western province of Vaasa indicates a need for further investigations, in which genetic as well as environmental factors should be taken into account.

The mean annual incidence of MS during the 5-year periods was highest for the second period, 1969 to 1973, in both provinces. The increase of incidence rate between the first and second 5-year periods was significant. However, the highest figure for women of Vaasa was in the last 5-year period, 1974 to 1978. The increase of the mean annual incidence rate for all MS patients could be attributed to a more careful registration of cases. The continuous increase of the incidence for women also raises the question of a real increase of MS—at least in Vaasa. If the incidence had not changed, the rate for the last 5-year period should be lower, because the diagnosis is often confirmed several years after the first symptoms. Delay in diagnosis may explain the decline of the incidence for men seen for the last 5-year period. During the time from 1964 to 1978, the female-to-male incidence ratio increased from 1.2 to 2.0 in Uusimaa and from 1.0 to 2.2 in Vaasa. This change, together with the change in incidence rate, might point to an increasing frequency of MS among women. However, additional incidence studies for more recent periods are required to give a final answer to this question.

If we assume a life expectancy of 30 for MS patients after onset, the prevalence of MS should be 75 per 100,000 in Uusimaa and 114 per 100,000 in Vaasa. Since data for Uusimaa in earlier studies^{2,3} were close to the mean figure for the whole country, the total number of MS patients in Finland is about 3,500. Although there were significant differences in the frequency of MS in these two provinces, there were no remarkable differences in the distribution of signs and symptoms at onset. The distribution of the first symptoms was also similar to results elsewhere in the world.^{5,14,18}

If we compare these results with incidence data from other countries, the rates in Vaasa are among the highest ever reported. Most studies have also included probable and possible MS cases, whereas this series included only definite MS cases. Higher incidence rates have been found in the Orkney and Shetland Islands¹⁰ and in northeast Scotland.¹⁴ The Scottish study was not based on definite cases, and it was retrospective. Thus, the results are not fully comparable with the present data.

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