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Multiple sclerosis and lifestyle factors: the Hordaland Health Study

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Abstract This study compared multiple sclerosis (MS) patients (n=87) with the general population and with people reporting angina pectoris (n=109), asthma (n=1353) and diabetes (n=219) regarding health-related quality of life (SF-12), working status and lifestyle factors including smoking, alcohol consumption, body mass index (BMI) and leisure physical activity. The study was cross-sectional and included the birth cohorts from 1950 to 1957 living in Hordaland County, Norway in 1997. A total of 22 312 people participated, yielding a response rate of 65%. The MS patients had a high rate of smoking and a low mean BMI, despite lower leisure physical activity compared with the rest of the study population. This suggests that it may be advisable to increase the focus on smoking, physical activity and the balance between energy intake and use.

Key words Multiple sclerosis • Lifestyle factors • Quality of life • SF-12 Health Survey

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Introduction

Multiple sclerosis (MS) is a chronic nervous system disease that produces various symptoms and signs and may lead to severe disability. Still, population-based studies show that the majority of patients are ambulatory even after many years of disease duration [1, 2]. Health care workers often underestimate the difficulty such MS patients have with work and activities of daily living [3, 4]. Quality of life measures indicate the overall impact of the disease and may describe the areas that need more focus. In addition to physical disability, disease-related symptoms such as bladder dysfunction [5], sexual problems [5] and fatigue [6] strongly influence patients' quality of life. Several studies have shown that MS patients have markedly lower quality of life than the general population [1, 2, 7, 8], and also lower than patients with epilepsy, diabetes [9], rheumatoid arthritis and bowel diseases [10]. MS may also influence lifestyles, including such factors as diet, leisure physical activity, smoking and alcohol consumption, which again are known to influence quality of life [11]. Studying the lifestyles of MS patients may therefore provide information that is useful in advising them.

This population-based study aimed to describe lifestyle factors, such as smoking, alcohol consumption, physical activity and body mass index (BMI), as a measure of energy balance among MS patients. The study compared MS patients with the general population and with people reporting angina pectoris, asthma and diabetes, more common chronic diseases that also markedly affect daily life.

Methods

Study population

The present study is a part of a wider screening on health status in Norway, the Hordaland Health Study 1997–1999 (HUSK). It

was conducted as a collaboration between the National Health Screening Service, the University of Bergen and local health services [11]. The study population included the cohort of all 29 400 individuals born between 1953 and 1957 residing in Hordaland County on 31 December 1997. The study also included a follow-up of a sample of 4859 individuals born in 1950 or 1951 who had participated in an earlier study in 1992–1993. The 22 312 individuals participating were thus 40–47 years old at the time. The participation rate was 65%: 60% for men and 72% for women. There were only small differences in response rate regarding age and education. The study was performed as a cross-sectional study, including questionnaires and measurements of weight and height, taking place from October 1997 to June 1999. The study protocol was approved by the Regional Ethics Committee and by the Norwegian Data Inspectorate.

Measurements

Measurements included height, weight measured during examination and a number of biological tests ascertained for other study purposes. Self-administered questionnaires included a health-related quality of life instrument, questions on various lifestyle factors and a question on employment. The participants were asked to report whether they had had paid employment of more than 100 hours during the past 12 months. Information on smoking was obtained by asking about current smoking, number of cigarettes per day and previous smoking. Alcohol consumption was determined by the number of standard drinks consumed per 2 weeks. Leisure physical activity was registered as the number of hours per week, with light activity meaning no sweating or being out of breath and strenuous activity meaning sweating and being out of breath. The BMI, calculated as weight in kilograms divided by the square of height measured in meters, was used to indicate the ratio between energy intake and energy use. BMI between 20 and 25 corresponds to a recommended range of normal weight [12]. The participants were further asked to report whether they had MS, angina pectoris, asthma or diabetes.

Health-related quality of life was measured using the SF-12 Health Survey [13, 14]. This is a shorter form of the widely used SF-36 Health Survey and includes 12 of the 36 questions constituting the SF-36 [15]. This shorter version is recommended for large population surveys such as this one, and has been shown to capture about 90% of the variance of the full SF-36 [16]. The 12 questions are summarised into a physical component summary scale (PCS) and a mental component summary scale (MCS) [13]. These scores are standardised so that 50 correspond to the mean score of this general population. A deviation of 10 corresponds to one standard deviation in the general population.

We also calculated the eight subscales of physical functioning (two items), role limitations due to physical problems (two items), bodily pain (one item), general health (one item), vitality (one item), social functioning (one item) role limitations due to emotional problems (two items) and mental health (two items). These subscales were standardised to have a mean of 50 and a standard deviation of 10 in the total study population. The items of the first four of these scales have the highest load on the PCS, and the items of the latter four scales have the highest load on the MCS.

Disease prevalence rates and rates of employment were adjusted for gender because women had a higher response rate than men.

Results

A total of 87 individuals reported having MS, of whom 65 (75%) were women. Adjusting for the higher response rate among the women in the total study population, the percentage of MS patients who were women would be 71%. This gives a crude prevalence rate of 390 per 100 000 in the population participating and a gender-adjusted rate of 376 per 100 000. The mean age at onset was 32.6 years. The mean duration of disease at examination was 12.8 years (range 1–29). Table 1 shows the prevalence and mean age at onset for the other diseases.

A total of 90% of the total study population had paid employment at the time of study (Table 1): 94% of the men and 87% of the women. The figures for the MS patients were 68% for all patients: 77% among men and 65% among women. Adjusting for differences in sex distribution between the disease groups, the rates of employment ranged from 70% for the angina pectoris patients to 87% for the patients with asthma. The gender-adjusted rate for MS was 71%.

A total of 40% of the MS patients were current smokers *vs.* 36% in the total study population (Table 2). The patients with diabetes had significantly lower alcohol consumption than the total study population, but no signifi-

Table 1 Percentage men, mean age at onset, prevalence per 100 000 population and percentage employed among individuals reporting four chronic diseases in a general population of 22 312 individuals aged 40–47 years in Hordaland County, Norway

Disease	n	Men, %	Age at onset, mean (SD)	Prevalence[a]	Currently employed, %[b]
Multiple sclerosis	87	25	33 (8.4)	376	71
Angina pectoris	109	68	40 (6.4)	506	70
Asthma	1353	42	23 (16.1)	6021	87
Diabetes	219	49	34 (10.2)	986	74
Total population	22 312	46	–	–	91

[a] Gender-adjusted prevalence rate per 100 000 population

[b] Percentage adjusted for gender using 50:50 as the reference

Table 2 Current smoking and mean body mass index (BMI) in four groups of chronic diseases and in the total study population of 22 312 individuals in Hordaland County, Norway

Disease	Current smoking		BMI, mean (SD)	*p*-value[b]
	n (%)	*p*-value[a]		
Multiple sclerosis	34 (40)	0.40	23.5 (3.6)	<0.0001
Angina pectoris	47 (43)	0.084	27.5 (3.8)	<0.0001
Asthma	514 (38)	0.019	26.2 (4.5)	<0.0001
Diabetes	68 (32)	0.26	28.4 (5.2)	<0.0001
Total population	7823 (36)		25.4 (3.8)	

[a] Difference from total study population compared by chi-square test and *t*-test[b]

cant differences were found for the other diseases (data not shown).

The mean BMI varied significantly between the groups; the MS patients' mean score was lower than that of the total population (Table 2). Of the MS patients, 11.3% had a BMI below 20, *vs.* only 4.1% of the total population. The people with other diseases had a significantly higher mean score than the total population, with diabetes having the highest mean of 28.4. The MS patients reported performing significantly (chi-square) fewer hours of strenuous leisure physical activity per week than the other disease groups and the general population (Fig. 1). A total of 63% of the MS patients performed no such activity. Similarly, the MS patients also performed significantly fewer hours of light physical activity (data not shown).

The MS patients scored lowest (36.9) of all groups on the SF-12 physical summary score (PCS) (Table 3) and also for three of the four subscales loading most for this scale, physical functioning (30.0), role physical (36.4) and general health (40.0). People with angina pectoris scored lowest on the bodily pain scale (39.9). Further, people reporting angina pectoris, asthma and diabetes had significantly lower PCS scores than the general population.

There was generally less deviation for the MCS, although all patient groups scored lower than the general population (Table 4). The people with MS and angina pectoris generally scored lower on the four subscales than the patients with asthma and diabetes.

The mean physical functioning score of MS patients with current employment was 34.8 (*vs.* 19.4 for those out of work). This score was still substantially lower than the mean score of those not employed in the total population (41.4).

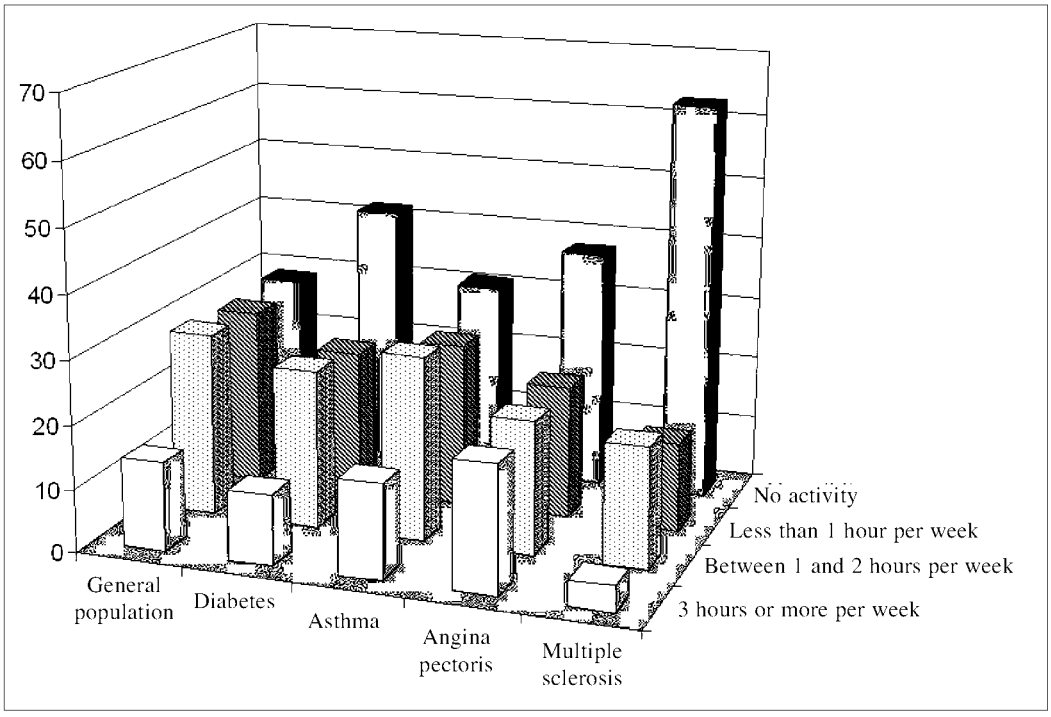

Fig. 1 Leisure physical activity in four disease groups and the total study population of 22 312 individuals in Hordaland County, Norway. The bars represent percentage distribution

Table 3 Mean scores of the physical composite summary scale (PCS) and the four subscales loading most for this scale in four groups of chronic diseases and in the total study population of 22 312 individuals in Hordaland county, Norway. All scales are standardised such that the standard deviation is 10. All mean scores in each of the groups of diseases were significantly lower than the total population mean compared by *t*-tests

Disease (n[a])	PCS	Physical function	Role physical	Bodily pain	General health
Multiple sclerosis (65)	36.9	30.0	36.4	43.3	40.0
Angina pectoris (103)	40.7	38.5	42.9	39.9	40.5
Asthma (1168)	46.5	45.5	46.6	46.8	46.3
Diabetes (182)	45.6	44.9	46.4	47.0	43.2
Total population (19 590)	50.0	50.0	50.0	50.0	50.0

[a] The numbers corresponds to the number of patients for each disease who gave sufficient responses to calculate the complete PCS

Table 4 Mean scores of the mental composite summary scale (MCS) and the four subscales loading most for this scale among 6 groups of diseases and the total study population of 22 312 individuals in Hordaland county, Norway. All scales are standardised such that the standard deviation is 10

Disease (n[a])	MCS	Vitality	Social function	Role emotional	Mental health
Multiple sclerosis (65)	48.5	42.6[b]	42.6[b]	46.3[b]	47.2[b]
Angina pectoris (103)	46.3[b]	44.2[b]	42.3[b]	46.2[b]	44.8[b]
Asthma (1168)	48.8[b]	47.6[b]	47.2[b]	48.4[b]	48.0[b]
Diabetes (182)	48.1[b]	46.7[b]	46.5[b]	48.0[b]	47.1[b]
Total population (19 590)	50.0	50.0	50.0	50.0	50.0

[a] The numbers corresponds to the number of patients for each disease who gave sufficient responses to calculate the complete MCS
[b] Mean scores significantly lower than total study population compared by *t*-tests

Discussion

The MS patients had lower scores for both PCS and MCS and for all subscales of the quality of life questionnaire than the general population and lower scores than the patients with asthma, diabetes and angina pectoris for most subscales. The patients with angina pectoris also had markedly reduced quality of life and had the lowest score for the bodily pain subscale, reflecting the nature of this disease.

Patients with MS, angina and asthma had slightly higher rates of current smoking than the general population. Smoking is a known risk factor for both asthma and angina, and recent studies suggest that smoking also is a risk factor for MS [17, 18]. Although many MS patients had quit smoking, as many as 40% were still smoking. An earlier study of the same general population showed that smoking is related to markedly reduced health-related quality of life and that previous smokers had almost the same score as never smokers [11]. This suggests a potential for improvement by focusing more on quitting smoking for MS patients.

Another lifestyle factor known to strongly influence the health-related quality of life is leisure physical activity [11]. The MS patients reported spending markedly less time on both strenuous and light leisure physical activity. This is probably related in part to the physical disability many of these patients had. The possible effects of vigorous training on the disease process in MS are little known. A concern for patients' thermosensibility might influence the advice given regarding physical activity. Nevertheless, two studies have shown that aerobic training positively influences the quality of life of MS patients, and further, that the more disabled group seemed to profit most from the training programme [19, 20]. The result of increased physical activity gives, in addition to a positive effect on quality of life, a general benefit of reduced weakness, fatigue and other health risk factors related to detraining and deconditioning [20].

Despite the low leisure physical activity, the MS patients had a markedly lower mean BMI than the general population. Almost three times as many MS patients as the general population were below the recommended range. This could be related to change in metabolism after the onset of disease or muscle atrophy as a result of reduced muscle activity resulting from neural impairment, although this is less likely, as most of these patients were still ambulatory and working. Another explanation could be that the low BMI is related to aetiological factors [21]. Regardless of the reason for this finding, the balance between energy

intake and use should be given attention [22], as an excessively low BMI has been shown to be related to lower quality of life scores in this age group, especially for the mental components [11].

In contrast to the MS patients, the other three groups of patients had higher BMI scores than the total population. The people reporting diabetes had the highest BMI, and this group also reported less leisure physical activity. These findings reflect the causative role of overweight and physical inactivity in diabetes.

The major clinical aspect of MS is physical disability. Nevertheless, 71% of the MS patients had paid employment. The patients' Expanded Disability Status Scale (EDSS) score was not ascertained in this study, but one study found a correlation between the SF-12 physical functioning subscale and the EDSS score of 0.76 [23]. Based on regression between these two variables, the mean EDSS score is an estimated 3.5 in our patient population: 3.0 among those employed and 4.5 among those out of work. This shows that many MS patients are able to work despite their physical disability. This possibly reflects the coping skills of patients with long-term progressive illnesses [24]. The high employment rate among the MS patients also reflects the age of the study population of 40–47 years and the general high employment rate in Norway. Nevertheless, the only slightly higher rate of 74% among the people with diabetes, who have markedly better physical functioning, underlines the relatively high employment rate among the MS patients.

The diagnosis of MS in this study was based on self-report. Nevertheless, people who have been diagnosed as having MS are well aware of their diagnosis, and individuals without this diagnosis will probably not report having MS. A large study of female nurses in the USA found that as many as 93% of the respondents who reported having MS were confirmed by hospital files [17]. A similar validity of disease status is expected in our study population, which represents a high-risk area that has been extensively studied and in which the community is familiar with the disease [25–27]. The age-specific prevalence rate, including patients with neurologist-based diagnosis only, in a study of the same county in 1994 was 338 per 100 000 people 40–49 years old [27]. This is slightly lower than the rate found in the present study, assuming the same frequency of non-response among MS patients as the rest of the population (390 per 100 000). This could reflect a slight increase in the prevalence rate during these 4 years or that the MS patients in the present study had a slightly higher response rate than did the total study population.

The study population had a narrow age-span: 40–47 at the time of the study. This reduces the ability to generalise the results to younger and older people. Nevertheless, as both the quality of life and lifestyle factors are strongly correlated with age, eliminating age as a possible confounding factor for the various associations facilitates the interpretation of the results and comparison across disease groups. Further, the population-based study design makes the comparison with the general population valid.

In conclusion, many MS patients had a BMI below the recommended range despite low leisure physical activity. The MS patients showed a high rate of smoking, while no difference in alcohol consumption was found between the MS patients and the general population. This suggests a potential for improvement of quality of life by quitting smoking and by increasing physical activity. Although these are recommendations valid for everybody, they might be particularly important for these patients as they already have a markedly reduced health-related quality of life. Further, they might focus on an improved balance between energy intake and use, although the complex factors and relationships that influence activity and energy balance in this disabled population needs to be further explored before specific recommendations can be made.

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