Comorbidity in multiple sclerosis patients from the Nordland County, Norway – validated data from the Norwegian Patient Registry

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Abstract

Background: Knowledge of comorbid disorders is important to optimize therapy in multiple sclerosis (MS), but data are limited. The aim of this study was to assess comorbidity in persons with MS living in Nordland County on January 1, 2017.

Methods: Data were retrieved from the Norwegian Patient Registry (2008-2017) and validated through review of electronic hospital charts (1970-2017). Comorbidity was defined as any distinct disorder, classified in the *International Classification of Disease (ICD-10)*, that had existed or occurred after the diagnosis of MS was set.

Results: Data from 637 subjects were reviewed, and 97.5% were registered with at least one comorbid condition. Inflammatory bowel disease was confirmed in 1.3%, epilepsy in 2.8%, psychosis in 0.6%, hypothyroidism in 3.1%, type-1 diabetes in 0.3%, type-2 diabetes in 3.9%, myocardial infarction in 1.7%, cerebral infarction in 0.6%, subarachnoid hemorrhage in 0.2% and pulmonary embolism in 0.9%. Fourteen women, 3.3%, had breast cancer. Malignant melanoma was found in 0.5%, and non-melanoma skin cancers in 1.9%.

Conclusion: Compared to reports from other Norwegian epidemiologic studies, a higher proportion of inflammatory bowel disease and epilepsy was found. This is in accordance with findings from other studies. The prevalence of non-melanoma skin cancers was significantly higher than in the general Norwegian population, reported by The Cancer registry og Norway.

Introduction

Multiple sclerosis (MS) is a chronic inflammatory disease of the central nervous system (CNS), affecting mainly young adults [1]. Without tailored therapy, most patients will eventually develop severe disability. Early diagnosis and treatment is thus important in order to protect the CNS and maintaining function [2]. In patients with MS, comorbidity increases the diagnostic delay [3], and initiation of disease modifying therapy [4]. A complete knowledge of comorbidity is important to optimize risk stratification of individual patients for personalized therapies [5, 6].

One way to assess co-occurring disorders in persons with MS, is to use data from medical registers. The Norwegian Patient Registry (NPR) is a nationwide health register run by the Norwegian Directorate of Health. It was established in 1997, and the information is individually identifiable from 2008. Whenever a patient is treated in a hospital or by a private practice specialist with public reimbursement, the given diagnoses with the corresponding International Classification of Disease version 10 (ICD-10) codes are mandatorily reported to the NPR. By application, researchers may get access to these data. All Norwegian citizens are given a unique eleven-digit personal identity number, that is retained throughout life. This number is included in every hospital record, and is linked to another unique number in the NPR.

The aim of this study was to assess comorbidities in a cross-sectional population based cohort of all individuals with MS living in Nordland County, Norway at January 1, 2017.

Region

Nordland County covers an area of 38.463 km^2 in the northern part of Norway (figure 1). The population was 242 866 (119 758 women and 123 108 men) per January 1, 2017. The mean age of the inhabitants was 41.7 years.

The population in Norway was 5 258 317 (2 609 187 women and 2 649 130 men), and the mean age was 39.9 years. In total, 3 995 587 inhabitants were 20 years or older [7].

In Nordland, only public specialist health care in neurology exists, and includes the Department of Neurology at Nordland Hospital in Bodø and the neurological outpatient services at the hospitals in Mosjøen and Stokmarknes.

Methods

On the prevalence date January 1, 2017, 657 persons had confirmed MS in Nordland County according to criteria of Poser [8] or McDonald [9, 10]. However, only 637 had the MS diagnosis correct registered in the NPR [11], and these are the subjects included in the study. From the NPR, we retrieved all additional ICD-10 codes registered from the information that became individually identifiable in 2008 up to the prevalence date. For each individual in this cohort the medical records were scrutinized, and the comorbid condition was not included if it could not be confirmed.

Comorbidity was defined as any distinct condition or disorder that had existed or occurred after the diagnosis of MS was set [12].Cancers and chronic diseases were included regardless of the start before or after the diagnosis of MS. Acute disorders, however, such as myocardial infarction and stroke, were only included if they had occurred after the diagnosis of MS.

Statistics

The prevalence of the different comorbid diseases in the MS population was calculated by dividing the number of individuals with a disease by the total number of MS patients. The age standardized prevalence was calculated by the use of data from a standard European population [13]. For the acute occurring vascular comorbidities, the mean annual incidence was calculated by divide the number of new cases by person-years. Demographics of the population were obtained from Statistics Norway [7]. Cancer frequencies in Norway as of December 31, 2016, were obtained from the Cancer Registry of Norway [14]. The prevalence of cancer in the Nordland County MS population was compared to the calculated prevalence in the Norwegian population using chi-square tables. The significance level was set to $p < 0.05$.

Statistical analyses were performed by the use of Microsoft Excel for Windows 7 and IBM SPSS Statistics version 25.

Results

On January 1, 2017, 637 individuals in Nordland County were correctly registered with MS in the NPR [11], 426 women, mean age 52.5 (±13.5) years, and 211 men, mean age 52.1 (±14.2) years. Three hundred and fifty-nine individuals were diagnosed with MS before 2008 and 278 after. The total person-years living with MS in Nordland in the period 2008 - 2017 was 4392.

One or more comorbid conditions were registered in the NPR in 621 (97.5%) of the patients. The distribution of the comorbidities within the ICD-10 categories is shown in table 1.

Malignant comorbidities

Cancer was registered in the NPR for 45 MS patients. Of those 41 were registered correctly according to the hospital records (table 2). The mean age at the prevalence point was 62.2 (±10.0) years. The prevalence of overall cancer was 6.4%.

Malignant melanoma (C43) was correctly registered in three of the MS patients. The mean age at prevalence point was 50.7 (±5.3) years. The prevalence of malignant melanoma was 0.5%.

Non-melanoma skin cancer (C44) was correctly registered in 11 patients. The mean age at prevalence point was 63.1 (±10.2) years, ranging from 40 to 73 years. The age at the MS diagnosis was 44.3 (±12.1) years and the age of cancer was 57.7 (±10.3) years. Nine individuals got the diagnosis of MS before they got the non-melanoma skin cancer, of whom four had used disease modifying therapy (table 3). The prevalence of non-melanoma skin cancer was 1.7%. This is significantly higher than in the Norwegian population, according to The Cancer registry of Norway, where the prevalence is 0.29%, $p < 0.001$. In the population aged 20 years and above, the prevalence is 0.38%, and the difference remained significant, $p < 0.001$.

Breast cancer (C50) was correctly registered in the NPR for 14 women. The mean age at prevalence point was 61.1 (±13.7) years. The prevalence of breast cancer was 3.3% in women with MS. This was significantly higher than in the Norwegian female population, where the prevalence is 1.74%, $p = 0.015$. However, when compared to the prevalence of the Norwegian female population aged 20 years and above, where the prevalence is 2.28%, the difference was non-significant, $p = 0.16$.

One MS patient was registered with *colon cancer* (C18), and none was registered with cancer in the *lungs* (C33-34) or *urinary tract* (C65-68).

Non-cancer comorbidities

An overview of the non-malign comorbid disorders is given in table 4.

Thyroid disorder was registered in the NPR for 26 MS patients. One was registered with "Post-procedural endocrine and metabolic disorders, not elsewhere classified" (E89), but in the hospital record no indication of thyroid disorder was found. Twenty were registered with "Other hypothyroidism" (E03), and the diagnosis was confirmed in 19, of which four had elevated anti-thyroid peroxidase (TPO) and one had elevated anti- thyroglobulin. Four were registered with "Other nontoxic goiter" (E04), but only three actually had goiter. One of these had elevated TPO, and in total six individuals had elevated antibody levels. One was registered with "Thyrotoxicosis" (E05), but actually suffered from hypothyroidism. Hence, 20 (3.1%) MS patients, 16 (3.8%) women and 4 (1.9%) men, had hypothyroidism, four with increased TPO and one with increases anti-thyroglobulin. Twelve were diagnosed with hypothyroidism after the MS diagnosis, two in the wake of alemtuzumab treatment. The prevalence of thyroid disorder was 3.6%.

Diabetes mellitus (DM) was registered in the NPR for 29 MS patients. Twenty-six were registered with type-2 DM (E11), but the diagnosis was incorrect for two patients. Of the three patients registered with type-1 DM (E10), one had insulin treated type-2 DM. The prevalence of type-1 DM was 0.3%, and of type-2 DM 3.9%

Psychosis was registered in the NPR for four MS patients, one in each of the diagnostic group "unspecified organic or symptomatic mental disorder" (F09), schizophrenia (F20), "acute and transient psychotic disorders" (F23) and schizoaffective disorders (F25). We confirmed that the diagnosis was correct in all four cases, three women and one man. Two had MS at the

time of the first registered psychotic episode. The mean age at the prevalence point was 46.3 (±15.1) years. The mean age at the time of the MS diagnosis was 38.8 (±17.8) years and the mean age at the time of the psychosis diagnosis 36.3 (±21.4) years. The prevalence of psychosis was 0.6%.

Epilepsy (G40) was registered in the NPR for 20 MS patients, but the diagnosis was incorrect for two of them. The mean age at the prevalence point was 24.4 (±13.8) years. The mean age at the time of the MS diagnosis was 38.9 (±11.5) years and the mean age at the time of the epilepsy diagnosis 41.1 (±16.1) years. The prevalence of epilepsy was 2.8%.

Acute myocardial infarction (I21) was registered in the NPR for 11 MS patients, four women and seven men. All were registered correctly, and all had MS at the time of the myocardial infarction. The mean annual incidence was 250.4 per 100 000. The mean age at prevalence point was 65.8 (±9.9) years. The mean age at the time of the infarction was 61.4 (±9.0) years, and the mean duration for MS was then 16.1 (±10.0) years. The prevalence of myocardial infarction was 1.7%

Pulmonary embolism (I26) was registered in the NPR for six MS patients, five women and one man. The diagnosis was confirmed in everyone, and all had the MS diagnosis at the time of the embolism. The mean annual incidence was 136.6 per 100 000. The mean age at the event was 51.0 (±8.7) years, and the mean duration for MS was then13.3 (±8.7) years. The prevalence of pulmonary embolism was 0.9%.

Subarachnoid hemorrhage (I60) was correctly registered in the NPR for one MS patient.. The prevalence of subarachnoid hemorrhage was 0.2%. *Intracerebral hemorrhage* (I61) was not registered in NPR in any MS patients.

Cerebral infarction (I63) was registered in the NPR for 12 MS patients. One, however, had suffered the stroke prior to 2008. Of the remaining, only four had a correct diagnosis, giving a mean annual incidence of 91.7 per 100 000. The mean age at prevalence point was 63.0 (±12.0) years. The mean age at the time of the stroke was 58.8 (±13.1) years, and the mean duration for MS was then 16.5 (±10.3) years. The prevalence of cerebral infarction was 0.6%.

Inflammatory bowel disease (IBD) was registered in the NPR for ten MS patients. One, however, had a gastric ulcer and another had a colon polyp. Hence, eight MS patients had IBD, four with Crohn's disease (K50) and four with ulcerative colitis (K51). Six individuals (75%) were diagnosed with IBD before they were diagnosed with MS. The mean age at prevalence point was 52.9 (±13.4) years. The mean age at the diagnosis of MS was 41.9 (±10.2) and the mean age at the diagnosis of IBD was 37.3 (±15.7) years. The prevalence of IBD was 1.3%.

Rheumatoid arthritis (RA) was registered in the NPR for nine MS patients, but the diagnosis was incorrect for four. Two patients had seropositive RA (M05) and two had seronegative RA (M06). None were registered with juvenile arthritis (M08). All were diagnosed with MS before they were diagnosed with RA. The mean age at prevalence point was 61.3 (±11.5) years. The mean age at the diagnosis of MS was 36.5 (±18.6) and the mean age at the

diagnosis of RA was 54.3 (±16.6) years. The prevalence of RA was 0.6%.
SLE was registered in the NPR for one patient, but the diagnosis was incorrect.

Discussion

In the present study 97.5% of the persons with MS were registered with comorbid conditions in the NPR, and comorbidity is thus prevalent in a cross-sectional MS-population.

Due to the large number of different comorbidities registered, a discretionary selection of conditions was validated. This was based on findings in the screening process, information from existing literature, and the likelihood of the disorder being treated and registered in hospitals or by a specialist.

The mean age of our MS cohort was 52.5 years, compared to 39.9 years in the general Norwegian population. This limits the possibility to compare our results directly with data from the general population. To account for this, we therefore compared some of our figures with data from the adult population, 20 years of age and above. This was found relevant for non-melanoma skin cancer and breast cancer. The incidence of these types of cancer is rare in individuals younger than 20 years [14, page 32-35].

Low exposure of sun during childhood seems to be a risk factor for MS in our area [15]. Nordland County is located in high latitude with limited sun exposure during the year. Studies have found an association to latitude and low sun exposure, vitamin D and melanoma and non-melanoma skin cancer rates [16]. Based on this, low occurrence of melanoma and non-melanoma skin cancer in the MS cohort could be expected. A British study indeed found low

incidence of skin cancer in the MS group [17]. In a more recent Canadian study, however, the risk of non-melanoma skin cancer was significantly increased in patients with relapsing-onset MS [18]. Data regarding malignant melanoma are contradictive, and increased incidence of malignant melanoma has also been reported [19]. We found a prevalence of malignant melanoma of 0.5% in the MS population, which is equal to the general Norwegian population. [14]. The prevalence of non-melanoma skin cancer, however, was significantly higher than what is found in the general population.

Some studies indicate increased incidence of breast cancer in the MS population [20]. We found a higher prevalence when compared with the prevalence in the total Norwegian population. However, when using data from the population 20 years and older the difference was no longer significant, and the increased incidence found is probably explained by the age in the MS-cohort.

Smoking is considered a risk factor for MS [21], and is a major cause of lung- and urinary bladder cancer. We have recently reported increased risk of cancers in the respiratory organs, from a large MS-cohort [22], but this was not confirmed in this cohort from Nordland County. The same study also reported increased risk of cancers in the urinary tract organs that was not confirmed in this cohort. The longitudinal (life-long for several patients) study design, compared to this cross-sectional cohort study, may explain this difference. Unfortunately, we did not have reliable data on smoking from our MS population.

In the present study the prevalence of IBD was 1.3%, that was 1.6 times higher than reported in a general Norwegian population, where the prevalence was 262 per 100 000 for Crohn's disease and 505 per 100 000 for ulcerative colitis [23]. Our result was however in accordance

with other international studies. An increased risk of IBD in MS patients, as well as an increased risk of MS in IBD patients has previously been shown [24].

We found hypothyroidism in 3.7% of the women and 1.8% of the men in the MS population. This is lower than the findings from a previous Norwegian study in a general population [25]. Increased risk of thyroid disease among MS patients has been reported [26], but contradicted by others [27]. We also found a low prevalence of DM compared to a recent Norwegian study, where the prevalence of type 2 diabetes mellitus was 6.1% [28]. Both hypothyroidism and type 2 diabetes are most often diagnosed and treated by general practitioners, and thus not necessarily registered in the NPR, probably giving underestimated prevalence figures in our cohort.

We found rheumatoid arthritis in 0.6% in the MS population, that was comparable to figures reported from the neighboring county , where the prevalence was 0.47% in 1994 [29].

We confirmed that epilepsy is frequent in MS, with prevalence four times more frequent than in the general Norwegian population of 0.7% [30]. The increased prevalence of epilepsy is in accordance with other studies [31].

A Norwegian study from 2001 found a lifetime prevalence of non-affective psychosis of 0.4% in the general population [32]. We found the prevalence of individuals who have experienced psychosis to be slightly larger, 0.6%, but the numbers afflicted are too small to a make a reliable statistic interpretation. Others have found an increased prevalence of psychosis in the MS population [33].

A recent study reported an increased risk of acute myocardial infarction in MS patients [34]. In the Nordland MS population, the mean annual incidence of myocardial infarction was 250.4 per 100 000. In a study from Northern Norway of the general population older than 25

years, the age and sex adjusted incidence of myocardial infarction in 2010 was 224 per 100 000 [35]. Studies have also found increased incidence of stroke among MS patients [36]. In the present study, 1.7% of the MS-population had suffered stroke in the period, with a mean annual incidence of 91.7 per 100 000. In comparison, a study from Northern Norway of individuals in the normal population older than 30 years found 367 strokes per 116 703 person-years in the period 2006 – 2010, giving an annual incidence of 314.5 per 100 000 [37]. We found that only four out of 11 registered with cerebral infarction (I63) in the NPR actually had suffered from stroke. For the others, the symptoms and findings were considered as manifestations of their MS. In a clinical setting, it is sometimes difficult to distinguish stroke from exacerbation of MS. Regarding classification and epidemiology, such difficulties may cause diagnostic misinterpretation in both directions.

Our data was validated and compared to reliable national data from the Cancer Registry of Norway and relevant epidemiologic studies. However, we did not have a matched validated control groups, and only diagnosis registered in the NPR were included. Important conditions, such as depression, anxiety and psoriasis, as well as risk factors like hypertension and hyperlipidemia, are presumed to be handled mostly in primary care, and have thus been omitted, since these are therefore not registered into the NPR. Furthermore, we cannot exclude that other conditions also are under-reported to the NPR, and in that respect our figures may represent the lower limit of the real occurrence of comorbidities in MS.

Conclusion

The present study confirms an increased prevalence of inflammatory bowel disease and epilepsy in MS, but also suggests that the prevalence of non-melanoma skin cancer is

increased. The association between non-melanoma skin cancer and MS should be further investigated.

Ethics

The study was approved by the Regional Committee for Medical and Health Research Ethics (Rek Nord 2016/1531) and was conducted in accordance with ethical principles for medical research.

Disclaimer

Data from the Norwegian Patient Registry has been used in this publication. The interpretation and reporting of these data are the sole responsibility of the authors, and no endorsement by the Norwegian Patient Registry is intended or should be inferred.

The study has used data from the Cancer Registry of Norway. The interpretation and reporting of these data are the sole responsibility of the authors, and no endorsement by the Cancer Registry of Norway was intended nor should be inferred.

Authors declaration of interests

The authors have nothing to disclaim related to the topic

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Table 1. Individuals with diagnosis according to ICD10 as registered in the NPR

Chapter	Code range	Description	Patients
1	A00-A	Certain infectious and parasitic diseases	74
	B-B99		65
2	C00-C96	Cancer	45
	D00-D09	Carcinoma in situ	6
	D10-D49	Other neoplasia	103
3	D50-D89	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	32
4	E00-E89	Endocrine, nutritional and metabolic diseases	134
5	F01-F99	Mental, Behavioral and Neurodevelopmental disorders	137
6	G00-G99*	Diseases of the nervous system	214
7	H00-H59	Diseases of the eye and adnexa	288
8	H60-H95	Diseases of the ear and mastoid process	88
9	I00-I99	Diseases of the circulatory system	171
10	J00-J99	Diseases of the respiratory system	139
11	K00-K95	Diseases of the digestive system	224
12	L00-L99	Diseases of the skin and subcutaneous tissue	148
13	M00-M99	Diseases of the musculoskeletal system and connective tissue	263
14	N00-N99	Diseases of the genitourinary system	368

* Except G35 and G37. ICD10 = International Classification of Disease version 10, NPR = The Norwegian Patient Registry

Table 2. Cancer in the Nordland MS cohort and in the general Norwegian population

		Cancer in the Nordland County MS-population			Cancer in the Norwegian Population	
ICD 10	**Site**	**n**	**Prevalence %**	**Age standardized prevalence %**	**n†**	**%††**
C00-96	**All sites**	**41**	**6.44**	**3.23**	**262 884**	**5.00**
C00-14	**Mouth, pharynx**	**1**	**0.16**	**0.15**	**4 992**	**0.09**
C00	Lip		0		1 389	0.03
C01–02	Tongue		0		1 001	0.02
C03–06	Mouth, other		0		774	0.01
C07–08	Salivary glands	1	0.16	0.15	630	0.01
C09–14	Pharynx		0		1 272	0.02
C15-26	**Digestive organs**	**2**	**0.31**	**0.21**	**39 117**	**0.74**
C15	Oesophagus		0		647	0.01
C16	Stomach	1	0.16	0.06	1 987	0.04
C17	Small intestine		0		1 153	0.02
C18	Colon	1	0.16	0.08	21 532	0.41
C19-20	Rectum, rectosigmoid		0		11 789	0.22
C21	Anus		0		762	0.01
C22	Liver		0		529	0.01
C23-24	Gallbladder, bile ducts		0	0.07	469	0.01
C25	Pancreas		0		1 021	0.02
C26	Other digestive organs		0		191	0.00
C30-34, C38	**Respiratory organs**	**0**	**0**		**8 979**	**0.17**
C30–31	Nose, sinuses		0		351	0.01
C32	Larynx, epiglottis		0		1 108	0.02
C33-34	Lung, trachea		0		7507	0.14
C38	Heart, mediastinum and pleura		0		66	0.00
C40-41	**Bone**		0		**807**	**0.02**
C43	**Melanoma of the skin**	**3**	**0.47**	**0.26**	**24 594**	**0.47**
C44	**Skin, non-melanoma**	**11**	**1.73**	**0.83**	**15 425**	**0.29**
C45	**Mesothelioma**		0		**126**	**0.00**
C47	**Autonomic nervous system**		0		**245**	**0.00**
C48-49	**Soft tissues**	**0**	0		**1 599**	**0.03**
C50	**Breast***	**14**	**3.29**	**1.50**	**45 492**	**1.74**
C51-58	**Female genital organs***	**2**	**0.47**	**0.28**	**22 991**	**0.88**
C51–52, C57.7–9	Other female genital		0		960	0.04
C53	Cervix uteri		0		7 173	0.27
C54	Corpus uteri	1	0.23	0.11	10 347	0.40
C55	Uterus, other	1	0.23	0.17	50	0.00
C56, C57.0–4	Ovary etc.		0		4 657	0.18
C58	Placenta		0		154	0.01
C60-63	**Male genital organs****	**5**	**2.37**	**1.17**	**54 914**	**2.07**
C61	Prostate	3	1.42	0.58	47 088	1.78
C62	Testis	2	0.95	0.59	7 483	0.28
C60, C63	Other male genital		0		552	0.02
C64-68	**Urinary organs**	**1**	**0.16**	**0.09**	**20 531**	**0.39**
C64	Kidney (excl. renal pelvis)	1	0,16	0.09	6 816	0.13
C65-68	Urinary tract		0		13 877	0.26
C69	**Eye**		0		**1 086**	**0.02**
C70-72	**Central nervous system**		0		**13 165**	**0.25**
C73	**Thyroid gland**		0		**5 718**	**0.11**
C37, C74-75	**Other endocrine glands**		0		**3 900**	**0.07**
C39, C76, C80	**Other or unspecified**	**1**	**0.16**	**0.09**	**598**	**0.01**
C81-96	**Lymphoid/haematopoietic tissue**	**1**	**0.16**	**0.07**	**23 378**	**0.44**
C81	Hodgkin lymphoma		0		2 799	0.05
C82–86, C96	Non-Hodgkin lymphoma		0		9 672	0.18
C88	Immunoproliferative disease	1	0.16	0.07	597	0.01
C90	Multiple myeloma		0		2 045	0.04
C91–95	Leukaemia		0		8 461	0.16

†based on numbers from Cancer Norway, †† based on numbers from Cancer Norway and Statistics Norway, *based on the female population, **based on the male population

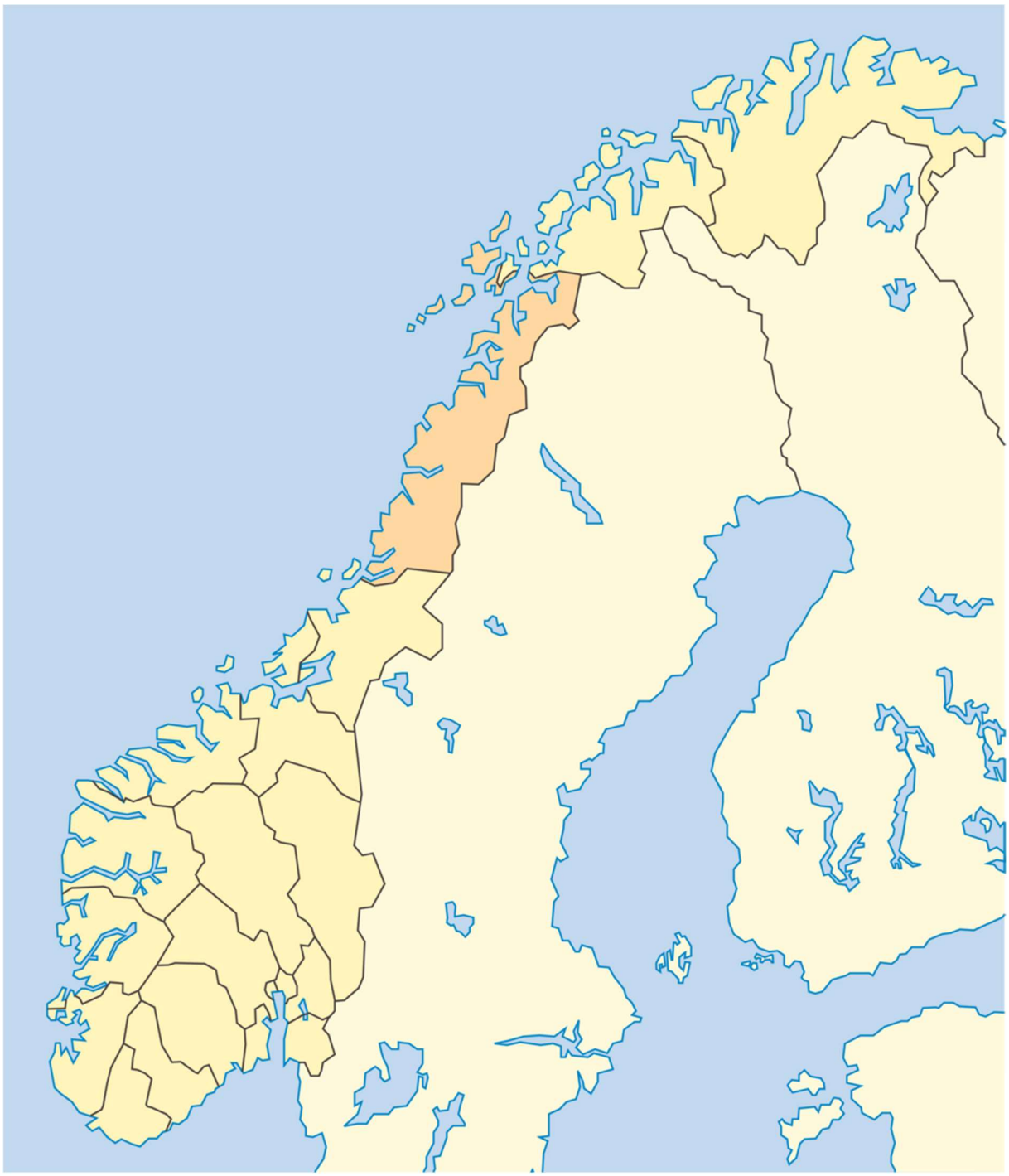
Table 3. Non-melanoma skin cancer (ICD-10 C44)

Subject	Sex	Age at prevalence	Age MS	Age C44	Type of MS	Type of skin cancer	MS treatment prior to skin cancer	Occupation	Ever-smoker
1	f	40	39	36	rr	*basal cell carcinoma*	none	teacher	yes
2	m	57	47	56	rr	*squamous cell carcinoma*	glatiramer acetate	office worker	yes
3	f	57	33	53	rr	*squamous cell carcinoma*	interferon beta-1b, natalizumab, fingolimod	secretary	yes
4	m	59	34	50	rr	*squamous cell carcinoma*	interferon beta-1a, glatiramer acetate	factory worker	yes
5	f	59	48	52	rr	*basal cell carcinoma*	interferon beta-1a, glatiramer acetate	secretary	no
6	f	62	29	57	rr	*basal cell carcinoma*	none	nurse	yes
7	f	70	39	61	?	*basal cell carcinoma*	none	shop-keeper	yes
8	m	72	70	68	pp	*basal cell carcinoma*	none	plumber/clerk	yes
9	m	72	53	60	rr	*basal cell carcinoma*	none	fisherman/farmer	yes
10	m	73	39	72	rr	*squamous cell carcinoma*	none	auto mechanic	yes
11	m	73	57	70	rr	*basal cell carcinoma*	none	artist	yes

Table 4. Non-cancer comorbid conditions in the Nordland County MS cohort

	ICD10	**n**	**Prevalence %**	**Age standardized prevalence %**	**Mean age (years) at prevalence (±SD)**
Hypothyroidism	E03	20	3.1	2.0	59.1 (±16.6)
Diabetes mellitus I	E10	2	0.3	0.2	47.0 (±7.1)
Diabetes mellitus II	E11	25	3.9	2.2	62.5 (±12.1)
Psychosis	F09, F20, F23, F25	4	0.6	0.5	46.3 (±15.1)
Epilepsy	G40	18	2.8	1.8	54.4 (±13.8)
Myocardial infarction	I21	11	1.7	0.8	65.8 (±9.9)
Pulmonary embolism	I26	6	0.9	0.5	56.0 (±8.2)
Stroke intracerebral hemorrhage	I61	0	0	0	-
Stroke subarachnoid hemorrhage	I62	1	0.2	0.1	74
Stroke infarction	I63	4	0.6	0.3	63.0 (±12.0)
Inflammatory bowel disease	K50, K51	8	1.3	0.8	52.9 (±13.4)
Rheumatoid arthritis	M05, M06	4	0.6		61.3 (±11.5)

Figure 1 Nordland County, Norway



Du bær merke kartet som eks dette:

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