ORIGINAL ARTICLE

Fatigue in persons who have lived with spinal cord injury for >20 years

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Objectives: This study aims to assess the prevalence of fatigue among persons who have lived with traumatic spinal cord injury (SCI) for >20 years, and to compare the results with fatigue scores found among the general population (GP). Another objective was to study the association between fatigue and clinical variables, including mental health, among the study population.

Design: A cross-sectional study.

Setting: Sunnaas Rehabilitation Hospital (SunRH), Norway.

Materials and methods: All SCI survivors ($n=237$) admitted for rehabilitation at SunRH between 1961 and 1982 were asked to participate. Fatigue was measured with the Fatigue Questionnaire (FQ). Mental health was assessed with the Hospital Anxiety and Depression Scale (HADS). Linear regressions were used to examine those variables with the potential to contribute to fatigue.

Results: A total of 153 persons responded to the FQ, and in 39 cases the scores were consistent with fatigue. Surprisingly, the prevalence of fatigue (total fatigue (TF)) did not differ between the study population and the norm. However, the results indicated statistically significantly higher score of physical fatigue (PF) and statistically significantly lower score of mental fatigue among the SCI group when compared with the GP. Higher fatigue scores were associated with fatigue-causing pharmaceuticals and with higher scores on the HADS-depression subscale.

Conclusions: The prevalence of fatigue was 25% among persons who had lived with SCI for >20 years, and similar to that in the GP. Our results point to medications and mental health aspects as possible contributors to PF severity in SCI.

Spinal Cord (2013) 51, 103–108; doi:10.1038/sc.2012.110; published online 16 October 2012

Keywords: spinal cord injury; fatigue; fatigue questionnaire; mental health

INTRODUCTION

Fatigue is defined as an overwhelming sense of tiredness, a lack of energy and a frequent feeling of exhaustion.¹ Commonly distinguished according to mental and physical forms, fatigue is oftentimes a disabling symptom found in a variety of medical and neurologic disorders.^{2,3}

Recent decades has seen life-expectancy improvements for persons who sustain a traumatic spinal cord injury (SCI). However, long-term survivors face complex, extraordinary and lifelong challenges.^{4,5} Today, clinicians and researchers find that fatigue is a consequence that magnifies the physical challenges of SCI and diminishes the quality of life.^{5–7} Fawkes-Kirby *et al.*⁸ found that fatigue was common among individuals with SCI who were seeking outpatient rehabilitation.

In quantitative studies, variables associated with fatigue include injury completeness, pain, spasticity, depression, use of fatigue-causing medications and the use of mobility aids.^{8–11} It is known that depression is common after SCI, and previous reports have documented a relationship between depression and fatigue.^{2,9} There is however a challenge to determine whether depression is a contributor to fatigue or vice versa.^{2,9}

In a qualitative study by Hammell *et al.*,¹² focus group interviews elucidated pain, depression and hopelessness, side effects of medications, poor quality of sleep, spasticity, poor posture, diet, and the effort required to accomplish routine and self-care tasks to be associated with fatigue.

Our clinical experiences found some chronic SCI patients complaining that fatigue symptoms, such as marked lack of energy and feeling exhausted, influenced their daily activities. The study objectives were to assess the prevalence of fatigue among a sample of Norwegians who have had SCI for >20 years, and to compare the results with fatigue scores measured among the general Norwegian population. We also wanted to explore the associations between fatigue and the following clinical variables: demographics, lesion characteristics, smoking status, medication, self-perceived health problems and mental health scores. Our main hypotheses are as follows: compared with norms, a higher prevalence of fatigue and higher levels of physical and mental fatigue scores exist among persons with long-term SCI. Our second hypothesis is that demographics, lesion characteristics, smoking status, medication, self-perceived health problems and mental health may influence on fatigue levels in persons with long-term SCI.

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Received 23 June 2011; revised 17 August 2012; accepted 17 August 2012; published online 16 October 2012

Figure 1 Overview of the inclusion process in the present study.

MATERIALS AND METHODS

Data for this study were collected as part of a multidimensional cross-sectional survey in 2004–2005^{4,13} (Figure 1). The inclusion criteria were: persons with traumatic SCI who were admitted for initial rehabilitation at Sunnaas Rehabilitation Hospital (SunRH) between 1961 and 1982. The SunRH, affiliated with the Oslo University, is the central spinal unit in Norway with a catchment area of about 2.75 million people (56% of the Norwegian population). Furthermore, two other spinal units in Norway are located in the Western Coast and in Northern Norway, respectively.

Data on fatigue among the general Norwegian population ($n = 2287$) were collected from a study published by Loge *et al.*¹⁴

Participants

The participants were recruited in 2003 by postal mail; letters were sent to all living persons who received a traumatic SCI between 1961 and 1982 (Figure 1). Collecting data (2004–2005) from the participants took place as follows: (1) a set of self-administered questionnaires was mailed with a stamped return envelope and an appointment for a personal interview; (2) a face-to-face interview and a clinical examination were undertaken. Four participants were interviewed by telephone due to a long distance. Another 21 participants were interviewed and examined in their respective homes. All interviews and examinations were conducted by the same person.

The Norwegian rules on privacy protection demanded consent from respondents and non-respondents before using their data in our research. To gain some information on non-respondents ($n = 58$), a brief questionnaire was mailed to them as well.

The study was approved by The Regional Ethics Committee in Oslo, Norway.

Measures

The Fatigue Questionnaire (FQ) was used to assess fatigue.¹⁵ The FQ was originally developed as a hospital study for chronic fatigue syndrome, to assess symptom severity, the detection of fatigue cases in epidemiological studies and as a valid estimator of change. The FQ has shown acceptable psychometric quality and has been translated into Norwegian.¹⁴ The FQ asks for fatigue symptoms experienced during the last month compared with how subjects felt when last feeling well. Of the eleven FQ items, seven items assess physical fatigue (PF) and four items assess mental fatigue (MF). All items have four response categories scored on a Likert scale: 0 = less than usual, 1 = no more than usual, 2 = worse than usual, 3 = much worse than usual; maximum total fatigue (TF) score = 33. The FQ contains two additional items on duration and extent of fatigue.

Loge *et al.*¹⁴ suggested the scores to be dichotomised: 0 = less than usual and no more than usual, and 1 = worse than usual and much worse than usual; maximum TF dichotomised score = 11. As in their validation study, we also defined fatigue to exist in cases where the sum of the dichotomised TF reached four or higher. Fatigue 'caseness' was classified if the dichotomised TF sum reached four or higher and fatigue lasted 6 months or longer.¹⁴

The Hospital Anxiety and Depression Scale (HADS) is often used to assess anxiety and depression.^{16–19} It is based on 14 items, each related to subscales designed to capture both anxiety (HADS-A, seven items) and depression (HADS-D, seven items). All items have four response categories (0 = not at all, to 3 = very often indeed). A score above eight in either of the subscales indicates anxiety or depression, respectively. The psychometric properties are considered to be quite good, and the HADS has been validated in the SCI population.¹⁹ A Norwegian study has supported the HADS as an instrument with good psychometric properties (factor structure, inter-correlation, homogeneity and internal consistency).²⁰ The scale does not include somatic items that could be caused by the SCI itself.

Demographic information on sex, age at injury, age at the time of the study and marital status were collected. Marital status was dichotomised into 'married/cohabitant' versus 'single'. Employment status was based on a checklist and categorised according to 'employed' (part-time or full-time paid work) and 'not employed' (students, unemployed and homemakers). Smoking habits were categorised as currently 'non-smokers' or 'smokers'. All participants were asked to indicate their present main health problem (open-ended question).⁴ We merged health problems into six categories reflecting the most frequent answers. As the number of variables used in the linear regression model is limited by the size of the studied population, we merged health problems further into three categories. The participants were asked for details about their daily medication, and their responses were merged into the following groups: (1) no daily medication at all; (2) medication that never or seldom causes fatigue as a side effect; (3) medication that often or always causes fatigue as a side effect; (4) medication with two or more drugs that often or always causes fatigue as a side effect. Medication side effects were identified by referencing the Norwegian formulary on pharmaceuticals ('Felleskatalogen') and then classified as either 'never' or 'seldom' causing fatigue or 'often' or 'always' causing fatigue in cases where reported side effects included fatigue, somnolence, drowsiness, weakness, sedation or asthenia.

After a clinical examination, the participants were grouped into 'tetraplegia' or 'paraplegia' according to the level of the SCI. For a neurological classification of SCI we used the ASIA Impairment Scale. ASIA Impairment Scale classes were merged into two groups: ASIA Impairment Scale A–C for 'functionally complete' and D–E for 'functionally incomplete' SCI. Injury aetiology was grouped according to the International Spinal Cord Injury Core Data Set.

Statistical analysis

Descriptive statistics included proportions, means and s.d., together with simple tests including χ^2 -tests of independence to compare categorical variables and t -tests and Mann–Whitney U -tests to compare continuous variables. Cronbach's alphas were created to assess the internal consistencies of fatigue scores. Prevalence of TF was reported with 95% confidence intervals computed via the Blaker procedure,²¹ and compared to norms¹⁴ using an exact χ^2 -test, assuming that the 22% prevalence reported by Loge *et al.* was 503 of 2287 persons. Fatigue scores in the SCI population were compared with expected scores based on age and sex in the general population (GP),¹⁴ using paired sample t -tests. Expected scores are mean values in a GP norm sample for the same sex and age group as each person in the study sample. No gold standard exists regarding the clinically significant numerical changes on the FQ. As done by Hjermstad *et al.*, we estimated the differences between the SCI population and the GP by calculating effect size; that is, the mean score difference across groups divided by the s.d. of the norm value.²² We regarded effect size of 0.2–0.5 as small, 0.5–0.8 as moderate and >0.8 as large.²³

A linear regression was used to study factors that might affect fatigue (TF sum), that is, age, sex, marital status, time since injury, level of injury, ASIA Impairment Scale classification, smoking status, medication use, health problems and mental health as measured with the HADS.²⁴ These variables were selected based on judgement and previous research.^{8–10} Collinearity problems were indicated if the variance inflation factor for any covariate exceeded five, and by Spearman correlations. P -values <0.05 were considered

significant. Adjustments for multiple testing via the Holm procedure were done within all simple analyses, within norm comparisons and within each regression. Analyses were performed in SPSS (versions 15.0 and 16.0), except the Blaker confidence intervals and Holm adjustment for multiple testing that used R (The R Foundation for Statistical Computing, Vienna, Austria), package Blaker CI for Blaker confidence intervals.

RESULTS

Population

A total of 179 individuals (76%) with traumatic SCI agreed to participate in the study. Information on the non-respondents ($n = 58$) was reported in our paper on health-related quality of life.⁴

At the time of the study, five persons were inaccessible or could not be reached, five persons could not find time to participate, three persons died before data collection, and one person was excluded owing to incomplete data. Of the 165 remaining persons who attended the study, 12 participants (two women; ten men) did not answer the questionnaire portions dealing with fatigue. Thus, data from 153 persons (response = 64.5%) were available for the current analyses (Figure 1).

Table 1 shows the characteristics of the study participants, and the differences between persons who scored normal versus persons having a dichotomised sum score of ≥ 4 with the FQ. A total of 57 participants reported daily use of one or more medications with

Table 1 Characteristics of all participants ($n = 153$), including persons without ($n = 114$) and with ($n = 39$) substantial fatigue as measured with the Fatigue Questionnaire, dichotomised scores

Category	Total $n = 153$	FQ < 4 $n = 114$	FQ ≥ 4 $n = 39$	P-value*
Sex				
Male n (%)	125 (82%)	97 (85%)	28 (72%)	0.064
Female n (%)	28 (18%)	17 (15%)	11 (28%)	
Mean age at injury (s.d.)	23.3 (9.6)	23.3 (10.1)	23.4 (8.0)	0.960
Range	3–55	3–55	8–46	
Mean age at follow-up (s.d.)	50.4 (9.5)	50.6 (9.6)	49.9 (9.5)	0.706
Range	24–81	24–81	34–78	
Mean time since injury (s.d.)	27.1 (4.2)	27.1 (4.4)	26.8 (3.7)	0.66
Range	20–37	20–37	21–35	
Employed at follow-up n (%)	57 (37%)	42 (37%)	15 (38%)	0.857
Married or cohabitant at follow-up n (%)	89 (58%)	69 (61%)	20 (51%)	0.312
Cause of injury				0.810
Sports n (%)	24 (16%)	18 (16%)	6 (15%)	
Assaults n (%)	5 (3%)	3 (3%)	2 (5%)	
Transport n (%)	86 (56%)	63 (55%)	23 (59%)	
Fall n (%)	28 (18%)	23 (20%)	5 (13%)	
Others or unknown n (%)	10 (7%)	7 (6%)	3 (8%)	
Level of injury				0.599
Tetraplegia n (%)	52 (34%)	40 (35%)	12 (31%)	
Paraplegia n (%)	100 (66%)	73 (64%)	27 (69%)	
Missing	$n = 1$	$n = 1$		
AIS classification				0.128
AIS A n (%)	106 (71%)	81 (71%)	25 (64%)	
AIS B n (%)	10 (7%)	9 (8%)	1 (2%)	
AIS C n (%)	11 (7%)	8 (7%)	3 (8%)	
AIS D n (%)	18 (12%)	9 (8%)	9 (23%)	
AIS E n (%)	5 (3%)	4 (3%)	1 (2%)	
Missing	$n = 3$	$n = 3$		
Medication usage				0.215**
No medicine usage n (%)	54 (35%)	43 (38%)	11 (28%)	
Medicine without known fatigue side effect n (%)	42 (27%)	35 (31%)	7 (18%)	
One medicine with fatigue side effect n (%)	38 (25%)	27 (24%)	11 (28%)	
More medicines with fatigue side effect n (%)	19 (12%)	9 (8%)	10 (26%)	
Smoking at follow-up n (%)	46 (31%)	29 (26%)	17 (44%)	0.461**
Missing	$n = 3$	$n = 3$		
Time period of onset of injury: 1961–1975 n (%)	76 (49%)	59 (52%)	17 (44%)	0.379
1976–1982 n (%)	77 (51%)	55 (48%)	22 (56%)	
HADS-A (s.d.)	3.6 (3.2)	3.2 (2.9)	4.7 (3.6)	0.169**
Range	0–13	0–12	0–13	
HADS-D (s.d.)	2.2 (2.6)	1.6 (1.9)	3.8 (3.5)	0.008**
Range	0–13	0–9	0–13	

Abbreviations: AIS, ASIA Impairment Scale (ASIA, American Spinal Injury Association International Neurological Standards for Classification of Spinal Cord Injury); FQ, Fatigue Questionnaire;

HADS-A, Hospital Anxiety and Depression Scale, anxiety; HADS-D, depression; s.d., standard deviation.

*P-value: difference between FQ < 4 and FQ ≥ 4 .

**P-value: adjusted P-value for multiple testing via the Holm procedure (unadjusted P-value < 0.05).

fatigue as a known side effect, whereof medications for cardiovascular disease, predominantly antihypertensives, analgesics and/or medications for spasticity were most common. Twenty-two per cent of the participants reported 'no health-problems', 16% reported 'severe pain problems', 13% reported 'problems related to the urinary tract', 10% reported 'musculoskeletal problems' and another 10% assessed 'my disability' as their main health problem. 'Other health problem areas' were reported with proportions <10%, including pressure sores, spasticity, and bowel related difficulties. Mean HADS total score was 5.8 (s.d., 5.02), mean HAD-A was 3.6 (s.d., 3.2), mean HAD-D was 2.2 (s.d., 2.6).

Fatigue

The internal consistencies for the TF, PF and MF segments were 0.81, 0.81 and 0.68, respectively. No collinearity problems were shown; the highest variance inflation factor was 1.7 both for TF, PF and MF. Also, the highest Spearman correlation (in absolute value) between covariates in our models was -0.56 between the two health problem dummies; all other Spearman correlations were 0.35 or lower in absolute value.

A total of 39 persons (25%; 95% confidence interval: 19–33%) of the SCI-participants reported a dichotomised TF sum equal to or above four, indicating fatigue. The prevalence of fatigue was not statistically different from the GP (dichotomised TF sum of 22%, 95% CI 20%–24%), $P = 0.316$. In this study, no incidents of 'caseness' were found.

Table 2 shows the results for TF, PF and MF compared to the GP.¹⁴ The ESs of the differences were small overall (TF: 0.11, PF: 0.21, and MF: 0.14), indicating small clinical differences.

Table 3 contains results from the linear regressions for TF, PF and MF, respectively. For TF and PF, the use of more medications with fatigue as a possible side effect and higher scores with the HADS depression subscale are associated with higher fatigue scores. None of the covariates investigated were related to MF, consistent with an adjusted R^2 about 0. For the TF and PF scores the models had some explanatory power, although the adjusted R^2 was rather low for these models also.

DISCUSSION

The most interesting finding from the present investigation is that the prevalence of fatigue in individuals who incurred a SCI >20 years ago does not differ from the prevalence found among the GP. However, some differences were seen with the subscales, as the SCI population scored statistically significantly higher with the PF and statistically significantly lower with the MF dimension of the FQ compared with norms. The daily use of more medications with a documented risk of fatigue as a side effect, and also higher scores on the HADS depression subscale, were associated with higher PF scores in persons with longstanding SCI.

We hypothesised a higher prevalence of fatigue and higher levels of physical and mental fatigue among persons with SCI of >20 years duration compared with the norm, but the findings did not support our theory. One explanation may be that persons with higher levels of fatigue may be less likely to participate in surveys. The study's results may have been influenced by a bias among participants; however, the response rate of 76% is relatively high. A point of concern is that the FQ norm data were collected about 8 years previous to our data, and we are not aware of more recent FQ norm data from Norway. The norm fatigue scores may have risen somewhat throughout the years, as more people are surviving longer with chronic and serious diseases. Thus, the prevalence of fatigue in the study population may be even less different from the norms. The findings also indicate that fatigue is less prevalent among our participants compared with other studies on SCI (7–10). The variability of findings between studies may be related to differences in study populations (age, time since injury, injury characteristics, comorbidity and so on) and methodological disparities, including fatigue measures used.

Despite a higher PF level and lower MF level in our SCI group compared with the norm, the differences probably do not represent any clinical importance (small effect sizes). However, our results suggest that PF is more prominent than MF components. A number of factors may cause high PF scores in persons with SCI, including usage of β -blockers, deconditioning and pain. The prevalence of additional conditions such as cardiovascular diseases and demanding more medications increases as people age. Many persons with SCI use the same medications for several years. According to our results, the daily intake of a number of antihypertensives, analgesics and medications for spasticity, probably affects PF, but to a small degree the mental dimensions of fatigue in persons with longstanding SCI. The findings support Lee *et al.*¹⁰ who also found that usage of a number of analgesics was statistically significantly contributing to higher fatigue scores as measured with the Fatigue Severity Scale. However, the Fatigue Severity Scale (unidimensional scale) does not distinguish mental and physical dimensions of fatigue.

The study participants scored better with the MF compared with norms. This could be due to a responder bias, as discussed above, or to a survival effect (see below). Another explanation could be that the FQ has not good enough discriminant validity for use in a population with longstanding SCI. The FQ has not been validated for use in this population. The effect sizes of the differences in fatigue scores were however small, thus indicating an insignificant clinical difference.

In our previous study on health-related quality of life,⁴ the same SCI-sample scored a non-significant difference with the mental health domain of the SF-36 compared with normal parameters, and overall better health-related quality of life compared with other SCI-populations. We suggested that one explanation might be that individuals with SCI often develop adaptive strategies over time that allow them to cope with complications and deterioration in

Table 2 Fatigue Questionnaire, differences between mean expected scores ($n = 2287$) and mean scores in the study SCI-population ($n = 153$)

	SCI mean (s.d.)	Expected mean (s.d.) ^a	Mean difference (s.d.)	95% CI	P-value*
Physical fatigue	8.5 (2.6)	7.8 (0.4)	-0.65 (2.66)	-1.07–-0.22	0.003 (0.009)
Mental fatigue	4.2 (1.0)	4.4 (0.1)	0.19 (1.04)	0.03–0.36	0.024 (0.048)
Total fatigue	12.6 (3.1)	12.2 (0.5)	-0.44 (3.18)	-0.95–0.07	0.091

Abbreviations: CI, confidence interval; s.d., standard deviation.

^aDerived from Loge *et al.*¹⁴

*P-values corrected for multiple testing (Holm correction) in parentheses for significant P-values.

Table 3 Multiple linear regression results: TF, PF and MF* in the SCI sample ($n = 153$) measured with the Fatigue Questionnaire and selected factors possibly affecting total fatigue

Variables	Total fatigue			Physical fatigue			Mental fatigue		
	Coefficient	95% CI	P-value	Coefficient	95% CI	P-value	Coefficient	95% CI	P-value
Sex									
Female	-0.108	1.423–1.206	0.871	-0.178	-1.256–0.900	0.744	0.091	-0.385–0.566	0.707
Male (ref.)									
Marital status									
Married/cohabitant	0.739	-0.289–1.768	0.157	0.638	-0.203–1.478	0.136	0.078	-0.294–0.450	0.681
Other (ref.)									
Age at interview (2004/05)	-0.020	-0.078–0.039	0.507	-0.015	-0.063–0.033	0.533	-0.003	-0.024–0.018	0.762
Time since injury	0.064	-0.055–0.182	0.290	0.053	-0.044–0.151	0.283	0.011	-0.032–0.054	0.601
Level of SCI									
Tetraplegia	0.028	-1.027–1.082	0.959	0.281	-0.581–1.143	0.520	-0.221	-0.603–0.160	0.253
paraplegia (ref.)									
AIS									
A-C	-0.817	-2.203–0.569	0.246	-0.681	-1.797–0.434	0.229	-0.207	-0.709–0.295	0.416
D-E (ref.)									
Smoking status									
Smoking	-0.376	-1.530–0.778	0.521	-0.337	-1.283–0.610	0.483	-0.046	-0.464–0.371	0.827
Non-smoking (ref.)									
Medication usage									
Medicine without known fatigue side effect	0.489	-0.795–1.773	0.452	0.367	-0.677–1.410	0.488	0.065	-0.400–0.529	0.783
One medicine with fatigue side effect	0.490	-0.795–1.774	0.452	0.288	-0.759–1.334	0.588	0.149	-0.315–0.614	0.526
More medicines with fatigue side effect	2.019	0.268–3.770	0.024*	1.925	0.495–3.355	0.009†	0.048	-0.586–0.681	0.882
No medicine (ref.)									
Main health problem^b									
No health problem	-0.070	-1.319–1.179	0.911	-0.178	-1.201–0.846	0.732	0.072	-0.380–0.524	0.753
Pain	0.458	-1.014–1.930	0.539	0.042	-1.166–1.250	0.945	0.405	-0.127–0.938	0.135
Other (ref.)									
Mental health									
HADS-A	0.074	-0.122–0.270	0.458	0.043	-0.118–0.204	0.596	0.033	-0.380–0.104	0.364
HADS-D	0.377	0.142–0.612	0.002**	0.358	0.165–0.551	<0.001‡	0.014	-0.071–0.100	0.738
Adjusted R^2	0.136	$F_{14,129} = 2.604$	$= 0.002$	0.164	$F_{14,130} = 3.017$	<0.001	-0.035	$F_{14,129} = 2.604$	0.811

Abbreviations: AIS, ASIA Impairment Scale (ASIA, American Spinal Injury Association International Neurological Standards for Classification of Spinal Cord Injury); CI, confidence interval; ref., reference category; HADS-A, Hospital Anxiety and Depression Scale—anxiety segments; HADS-D,—depression segments.

*TF, PF and MF summary score (Likert) was the dependent variable.

^bThe main health problem categories: 'problems related to the urinary tract'; 'musculoskeletal problems', 'my disability' and 'other health problem areas'; were for analytical purpose merged into one category, namely 'Other'. * $P = 0.314$ after Holm correction for multiple testing; ** $P = 0.026$ after Holm correction for multiple testing; † $P = 0.113$ after Holm correction for multiple testing;

‡ $P = 0.005$ after Holm correction for multiple testing.

function. The present MF results (that is, better MF outcomes compared with norms and no association between MF and the HADS) might reflect the same strategies, and also an effect of healthier persons/psychological stability analogous to survival effects. Instead, our results point to a relationship between PF and the HADS depression subscale.

We could not prove any association between fatigue and demographic and clinical variables such as sex, age, time since injury, marital status, level and extent of SCI, health problems or smoking. In previous studies, some of the above mentioned variables have shown relationships to fatigue.^{8–10} As previously mentioned, the variability of findings among studies may be related to methodological differences, and need further clarification.

LIMITATIONS

Information on the selection of patients for rehabilitation at SunRH in the 1960s and the early 1970s is lacking, and whether the studied population accurately represents the Norwegian SCI population is therefore debatable. However, based on two studies and an estimated 1-year mortality rate of 20%,^{26,27} we calculated that our cohort ($n = 387$) includes ~50% of all Norwegians injured between 1961 and 1982 who survived at least 1 year after SCI (calculations available on request).

The FQ is neither validated in a SCI population, nor has it been used in previous SCI-studies, thus making comparisons of our findings with other studies on SCI and fatigue restricted. It has been claimed that the presence of primary physical or cognitive

dysfunction may confound interpretations of the responses.²⁸ Also, Cronbach's alpha was slightly below 0.70 for the MF scale.

The relationship between depression and fatigue is complicated, and from this study we do not know whether depression brings PF or vice versa. The cross-sectional design does not capture changes over time, nor is it possible to draw causal connections.

In conclusion, this study indicates that the prevalence of fatigue in longstanding SCI does not exceed the prevalence of fatigue in the GP. PF was prevalent in 25% of those who incurred a traumatic SCI >20 years ago. Higher TF and PF scores seem to be associated with higher scores on the HADS depression subscale and also with the number of daily medications. With aging, it is important to consider drug side effects and tolerability when dealing with fatigue-like symptoms.

This study does not make inferences about causality, and it was not aiming to establish an understanding of how to treat fatigue. Randomised controlled trials or controlled before-and-after studies are needed before causal statements and effective treatment suggestions can be made.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

First and foremost we want to thank the study participants, the Norwegian Association of the Disabled and the Norwegian Association for Spinal Injuries. We also want to thank those who contributed financial support to the project: the Norwegian Foundation for Health and Rehabilitation (EXTRA), the Sunnaas Rehabilitation Hospital and the Eastern Norway Health Authority (Helse Øst). Thanks to Vegard Strøm for his valuable comments.

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