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PREDICTORS OF SICK LEAVE OWING TO NECK OR LOW BACK PAIN: A 12-YEAR LONGITUDINAL COHORT STUDY IN A RURAL MALE POPULATION

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Abstract: Back pain is a common cause of sick leave. We analyzed how individual, work-related and lifestyle factors predicted sick leave owing to neck or low back pain over a 12-year period. In this prospective cohort study, 1,405 rural middle-aged farmers and non-farmers were surveyed in 1990–1991 (participation rate 76%) and followed up 12 years later (participation rate 68%). The 836 men who reported having experienced unspecific neck or low back pain the year prior to survey 1 were followed up for self-reported sick leave owing to neck or low back problems. Individual, occupational and lifestyle factors and data on acquired specific neck or back diagnosis were included in multiple logistic regression models. Seven percent reported neck or low back related sick leave during the 12 year period. Self-employment was associated with a lower risk of sick leave while sedentary leisure time, snuff use and a specific neck or back diagnosis was associated with a higher risk. Age, education, physical workload, marital status, sense of coherence, smoking, and alcohol consumption were not independently associated with sick leave. The low risk of sick leave among the self-employed is notable from a societal and public health perspective.

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INTRODUCTION

The societal cost of sick leave is high in industrialized countries. Musculoskeletal disorders are common reasons for sick leave, although psychiatric illnesses are on the rise [1]. Unspecific neck and low back pain constitute a large part of the musculoskeletal illnesses behind sickness benefits. Musculoskeletal disorders, both osteoarthritis [24, 30] and unspecific symptoms such as low back pain [10] are more frequent among farmers than among non-farmers in the westernized population. However, farmers do not seek more health care due to musculoskeletal complaints and report fewer sick leaves than others [10, 11].

Neck and low back pain are common complaints also in the general population, experienced by most people for shorter or longer periods [22, 31]. A large body of research deals with risk factors for neck and low back pain and it is generally agreed that the etiology is multifactorial. Associations with physical workload [3, 25], psychosocial factors [14], and lifestyle [21, 23] are frequently reported but strong evidence of causal relationships are scarce. There is limited data on the long-term course of low back pain [9] and even less regarding neck pain. However, only a minority of those afflicted with neck and low back pain will be sick-listed for the condition.

Risk factors or predictors of sick leave for a specific condition are not necessarily the same as predictors of the condition itself. To date, too few and too heterogeneous studies on sick leave related to low back pain have been reported to allow for general conclusions on predictors [20].

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Extended understanding of neck and low back pain-related sick leave is needed for development of preventive measures on both the individual and public health level.

In a previous study of a rural cohort of middle-aged occupationally active men we found that seven percent of men reporting neck or low back pain during the year prior to baseline reported any period of sick leave owing to neck or low back pain during the following 12 years [12]. The aim of the present study was to analyze whether individual, work-related or lifestyle factors assessed at baseline, could predict subsequent sick leave owing to neck or low back pain over a 12-year period.

METHOD

Study population. The study cohort for the current analysis was a group of 836 men who reported neck or low back pain during the year prior to a baseline survey. A study cohort of 2,351 male farmers and non-farmers was established in 1989 with the intention of studying health promoting factors in farming [10, 29]. Power calculations were performed in order to enable analyses of primarily cardiovascular outcomes over ten years of follow-up.

All male farmers (40–60 years old at the time) living in nine different municipalities across Sweden were identified using the Swedish Register of Farming. Occupational activity in farming was checked thoroughly and only those men engaged in farming more than 25 hours per week were included. The municipalities were strategically selected to cover known morbidity gradients across the country [26], and to include areas with various types of farming. A non-farmer was matched to each farmer according to age, sex and residential area (parish) from the national population registry. The non-farmers had to be occupationally active but in some other area than farming according to the latest census available. The sampling procedure has previously been described in detail [10, 12, 29].

The study cohort was invited to an extensive baseline survey (*survey 1*) in 1990–1991 (participation rate 75.8%) and to a follow-up survey (*survey 2*) in 2002–2003 (participation rate 67.6%) with a similar content. The reasons for non-participation were similar at the two surveys except that the number deceased. The distribution of non-participation at *survey 2* was 143 deceased, 49 ill, 82 unable to attend, 192 unwilling to attend, 294 unknown reason, and 2 not retrievable. Both surveys were performed with specially trained personnel travelling to the various areas, and carried out as a separate research project and not part of any ordinary health programme. The participation rate was somewhat higher among the farmers than among non-farmers, although the setting was the same and the groups were not addressed differently.

Neck and low back pain definition. Self-reported neck pain and low back pain during the last year was assessed as separate items in a questionnaire answered at *survey 1*. The question on low back pain read: "Have you during the last year had problems in the lower back area (aches, pain or discomfort)?" The neck question included neck or shoulder aches/pain/discomfort, all of which is denoted as neck pain in this report to facilitate reading. The questionnaire also included queries on health care consultations owing to the symptoms, but for the current analyses no measure of pain severity was included [10].

Outcome measure. The dichotomous outcome analyzed in the present study was self-reported sick leave (yes or no) owing to neck or low back pain at any time during the 12-year follow-up period. Sick leave was assessed in a structured interview by an experienced physician at *survey 2*. No quantification such as number of sick leave days or number of sick leave episodes was included.

Potential predictors. The individual, work-related or lifestyle factors tested as potential predictors of sick leave were assessed at *survey 1*. The individual factors included were age, educational level, marital status and sense of coherence (SOC). Educational level was measured on a five grade scale from compulsory to university level. Marital status was asked about in a questionnaire and dichotomized into married/cohabitant versus single. Antonovsky's original 29-item questionnaire was used to assess SOC [2].

The form of employment was assessed in an interview as employment in private or public sector or self-employed. Physical workload was assessed in a structured interview by an experienced physician as the reported average number of hours working in a sitting or standing position, with a moderate, heavy or very heavy workload during an average working day according to Edholm's activity scale [16]. Experienced work demands and perceived work control were assessed in a questionnaire according to Karasek and Theorell [18].

Weight and height were measured with standard procedures, and body mass index (BMI) calculated as weight in kilograms divided by height in meters squared. Tobacco and alcohol consumption were assessed in a structured interview. Tobacco consumption was analyzed with two dichotomous variables, current daily smoking and current snuff use (smokeless tobacco). Average alcohol intake, computed as grams of pure alcohol consumed per week, was based on frequency of alcohol intake, type of beverage consumed and amount consumed on each occasion. Alcohol consumption was dichotomized as more or less than 60 grams of pure alcohol per week. Physical activity during leisure time was assessed in interview on a four grade scale (sedentary, low, moderate, or vigorous activity) and dichotomized for the analyses as sedentary versus active.

Having received a specific neck or back diagnosis during the follow-up period was considered a potential confounder. Therefore, this information, assessed in the structured interview by an experienced physician during *survey 2*, was also included in the analyses.

Ethical approval. This study was approved by the Research Ethics Committee at the Karolinska Institute in Stockholm, Sweden, and by the Regional Ethical Board, Uppsala, Sweden, in 1990 and 2001 (Dnr 90:19). The research was carried out in compliance with the Helsinki Declaration and all participants gave their informed consent.

Statistical analyses. The statistical analyses were conducted using SPSS® version 14.0. Comparisons between those reporting sick leave and those reporting no sick leave owing to neck or low back problems were made using a t-test for continuous variables and a Chi^2-test for categorical variables. To analyze associations between potential predictors and the outcome, multiple logistic regression models were applied. The results are presented as odds ratios (OR) with 95% confidence intervals (95% CI). In a first multiple logistic regression model, independent variables were included simultaneously and mutually adjusted. In a second model, backward elimination of variables with a p-value < 0.10 was performed and the final model adjusted for the remaining variables. The work control variable was

Table 1. Description of studied variables among rural men with neck or low back pain the year prior to survey 1 (N = 836).

	n	%	Mean	Sd[a]	Median	Range	Missing[b]
SURVEY 1							
Individual variables							
Age, years	836		50.0	5.9	49	40–61	0
Education							16
Compulsory school	317	38.7					
Vocational school	279	34.0					
Secondary school	92	11.2					
College	57	7.0					
University	75	9.1					
Married/cohabitant	741	88.7					1
Sense of coherence, units	836		151.8	19.0	153	91–201	0
Work-related variables							
Form of employment							0
Private sector	156	18.7					
Public sector	124	14.8					
Self-employed	540	64.6					
Farmer	529	63.3					0
Physical workload, units	821		203.2	84.5	206	24–537	15
Work demands, units	759		13.0	2.7	13	5–20	77
Work control, units	816		7.1	1.3	8	2–8	20
Lifestyle							
Body mass index	836		26.3	3.2	25.9	18–44	0
Smoking	180	21.6					1
Snuff use	127	15.2					1
Alcohol consumption, gram/week	833		24.4	28.0	15	0–227	3
> 60 grams/week	75	9.0					
Physical activity, leisure time							8
sedentary	251	30.3					
low	462	55.8					
moderate	97	11.7					
vigorous	18	2.2					
SURVEY 2							
Specific neck or back diagnosis during follow up	48	5.7					0
Sick leave owing to neck or low back problems during follow up	61	7.3					0

[a] standard deviation; [b] internal non-response

Table 2. Frequency of studied variables among participants reporting sick leave and among participants not reporting sick leave owing to neck or low back problems during follow up.

	No sick leave (n=775) mean or %	Sick leave (n=61) mean or %	p[a]
Individual variables			
Age, years	50.0	50.3	0.665
Compulsory school only, %	38.0	47.5	0.150
Married/cohabitant, %	89.1	83.6	0.187
Sense of coherence, units	152.1	147.4	0.061
Work-related variables			
Farmer, %	64.1	52.5	0.069
Self-employed, %	66.9	51.7	**0.019**
Physical workload, units	204.9	182.3	**0.044**
High work demands, %	59.8	52.8	0.321
High work control, %	56.4	40.7	**0.019**
Lifestyle			
Body mass index	26.3	26.4	0.893
Smoking, %	20.9	29.5	0.117
Snuff use, %	14.2	27.9	**0.004**
Alcohol >60 grams/week, %	8.4	16.4	**0.036**
Sedentary leisure time	29.3	42.6	**0.030**
Specific diagnosis during follow up, %	4.0	27.9	**0.000**

[a] t-test for continuous and Chi^2 for categorical variables

highly skewed towards high values and was dichotomized as the maximal eight points versus less than eight. The variable work demand had a high internal non-response rate and was therefore omitted from the analyses. In a final analysis, the receiver operator under the curve (ROC) was calculated in order to estimate the predictability capacity of the model. All tests were two-tailed and a p-value <0.05 was regarded as significant.

RESULTS

Of the 1,405 men participating in both surveys, 58 (2.5%) reported a specific back diagnosis (rheumatoid arthritis, ankylosing spondylitis or disc herniation) at *survey 1*, and were therefore excluded from the analyses in order to limit the follow-up analyses to those with unspecific symptoms. Of the remaining 1,347 men participating in both surveys and not reporting a specific back diagnosis at *survey 1*, 836 (62.1%) men reported having had neck or low back pain during the year prior to *survey 1*. These 836 men constitute the study cohort for the analyses described below.

Frequency and spread of studied variables is presented in Table 1. Sixty-three percent were farmers, and the vast majority were married. Physical workload, work demands and work control, SOC, and alcohol consumption had wide ranges. One-fifth were smokers and 15% used snuff daily. One third reported sedentary leisure time.

Sixty-one (7.3%) of the 836 men who had any neck or low back pain the year prior to *survey 1* reported sick leave

Table 3. Adjusted odds ratios (OR) and 95% confidence intervals (95% CI) for sick leave owing to neck or low back problems during 12-years of follow up of men having had neck or low back pain the year before baseline (n=783).

	Model 1[a]			Model 2[b]		
	OR	95% CI		OR	95% CI	
Individual variables						
Age, per year	1.00	0.95	1.05			
Compulsory school only	1.25	0.68	2.30			
Married/cohabitant	0.68	0.31	1.49			
Sense of coherence, per 10 units	0.95	0.81	1.11			
Work-related variables						
Self-employed	0.54	0.26	1.15	**0.49**	**0.27**	**0.91**
Physical workload, per 100 units	0.97	0.62	1.51			
High work control	0.61	0.33	1.13	0.59	0.32	1.07
Lifestyle						
Body mass index	0.96	0.87	1.06			
Smoking	1.05	0.53	2.08			
Snuff use	**2.17**	**1.06**	**4.41**	**2.17**	**1.11**	**4.24**
Alcohol consumption, >60 grams/week	1.29	0.52	3.20			
Sedentary leisure time	**2.02**	**1.09**	**3.77**	**2.05**	**1.11**	**3.77**
Specific diagnose during follow up	**8.81**	**4.12**	**18.86**	**8.81**	**4.20**	**18.46**

[a] model 1 – All listed variables mutually adjusted; [b] model 2 – Variables remaining after backward elimination of non-significant variables (p>0.10), mutually adjusted.

owing to neck or low back problems at least once during the follow-up period. Somewhat fewer, 48 men (5.7%), reported having received a specific neck or back diagnosis (rheumatoid arthritis, ankylosing spondylitis or disc herniation) during follow up, and this was strongly correlated with sick leave. Men with sick leave reported lower physical workload and lower work control, and fewer were self-employed than men who had not been on sick leave (Tab. 2). Twenty-eight percent of the men reporting sick leave used snuff daily as compared to 14% of the others. Higher alcohol consumption and sedentary leisure time were also related to sick leave in crude analyses.

In multiple logistic regression analysis, self-employment independently predicted a lower risk of sick leave (OR 0.49, 95% CI 0.27–0.91) and perceived work control showed a non-significant tendency in the same direction (Tab. 3). Snuff use and sedentary leisure time independently doubled the odds of sick leave. The strongest association with sick leave was having received a specific neck or back diagnosis during the follow-up period. Sedentary snuff users had an odds ratio for sick leave owing to neck or low back problems of 4.7 (95% CI 1.5–14.6) as compared to active men not using snuff in a fully adjusted model. The receiver operator under the curve (ROC) for this model was 0.78, implying a fairly good accuracy for the predictive capacity of the model.

DISCUSSION

Relatively few of the men with previous neck or low back pain had been on sick leave for the condition during the following twelve years. Having received a specific diagnosis during the study period was the strongest predictor of sick leave. Self-employment was associated with a lower risk of sick leave, whereas sedentary leisure time and snuff use, especially in combination, predicted sick leave. Physical workload, educational level and several other lifestyle factors showed no independent associations with sick leave.

The scientific knowledge concerning risk factors for neck and back related sick leave is insufficient. We therefore chose to study a variety of variables reported in the literature to be associated with neck and low back pain, in order to evaluate the impact on subsequent sick leave. In a recent systematic review on prediction of sickness absence in patients with chronic low back pain, Kuijer and co-workers conclude that there is no core set of predictors for sickness absence [20]. However, they found consistent evidence for the individual's own expectations of recovery as a predictor of the decision to return to work [20].

The study design with a very long follow-up time is both a strength and a weakness depending on perspective. The likelihood for recall bias is of course considerable. A selective recall bias might have influenced the results in that it is more probable that individuals with recurrent or chronic neck or back pain resulting in sick leave will remember and report it than individuals with shorter, transient, pain episodes, with shorter sick leave periods. A consecutive assessment of outcome data on sick leave would have been preferable although not possible for the current study. Register data on sick leave for longer retrospective periods is not accessible in Sweden. Recall bias underestimating the number of outcomes leads to underestimating of the real effect of neck and back problems on future sick leave. The effect of the studied variables might have been somewhat different with another method of sick leave registration.

The relatively small number of individuals reporting sick leave in this study should be viewed on the basis of the population-based design, and adds information from a public health perspective as opposed to studies on patient populations. Recall bias, as discussed before, may partially explain the low figure of 7.3%. However, the results cannot be directly generalized to the population since the design includes only middle-aged rural men with predominance of farmers. Today, farmers represent only a small fraction of the general workforce in Sweden. However, the study population is interesting from a salutogenetic (health promoting) perspective, since farmers have low morbidity and mortality, especially regarding cardiovascular disease and mental health problems [27, 28]. Co-morbidity has recently been noted to influence sickness absence [19].

The broad range of variables with a low internal non-response assessed on the individual level is an important strength of our study. In addition, we consider the participation rate fairly high considering the extensive surveys and the long follow up.

A specific neck or back diagnosis was the strongest predictor of sick leave in our study, and this is in line with previous research [7]. Disc herniation is the most common reason for specific neck or back pain, and symptoms are expected to last longer than for episodes of unspecific back pain. However, the strong association between a specific diagnosis and sick leave may partly be due to recall bias in that shorter sick leave periods for unspecific symptoms might be underreported. It is not possible to quantify this potential bias, but for hospitalization we found high correlation between self-reported data and registry data [29]. Others have reported retrospectively collected data on sick leave due to musculoskeletal disorders to be of acceptable validity [5]. Another statistical limitation is that this variable (specific diagnosis) was assessed at the second survey and thus is of a cross-sectional nature, while all other potential predictors were assessed at baseline.

The majority of the self-employed were farmers. Due to the strong correlation between farming and self-employment only one of the variables could enter the logistic regressions. Self-employment was chosen since this parameter had a stronger association with the outcome. We have previously demonstrated that farmers report less sick leave than rural referents for low back pain despite the fact that they report more low back problems [11]. Swedish farmers are self-employed but have access to the national health

insurance system like all other citizens. However, financial or other difficulties associated with being off work may still be one explanation for the lower risk of sick leave. Social dimensions such as different attitudes and norms relating to work might also be influential, although scientific findings on this matter among farmers or other self-employed are limited [17]. Aspects of attitudes could not be evaluated with our study design. However, self-employed persons had a significantly lower risk of sick leave than employed persons in a study with 180 patients with rheumatoid arthritis [34], and self-employed women with breast cancer were much less likely to report work absence during a three-year follow-up period in a Canadian study [4]. The health effects (positive as well as negative) of work absenteeism are not much evaluated from a scientific perspective. However, a recent study indicates that pre-term disability retirement is related to increased mortality independent of the underlying disease [32].

Sick leave is associated with non-medical factors, and can only partially be explained by illness and disease [33]. In a recent cross-sectional study, predominantly physical and psychosocial factors were found to be associated with musculoskeletal complaints, whereas individual factors were found to be associated with musculoskeletal related sick leave [15].

Heavy physical work, assessed in different ways, has been associated with low back pain, although it has been difficult to ascertain evidence of a causal effect [3, 25]. Few studies have shown evidence of an association between physical workload and neck and low back-related sick leave [7, 13]. In our study, including many farmers with high physical workload, no relation between physical workload and subsequent sick leave could be found after multiple adjustments. On the contrary, in crude analyses, those reporting sick leave episodes at follow up had significantly lower physical workload at baseline. This indicates, if anything, a protective effect of physical work. We also found that sedentary leisure time was predictive of sick leave, and this finding could be interpreted similarly. A certain level of physical fitness obtained either through work or leisure time activity might be protective. There is evidence of physical activity and a "stay active approach" for the treatment of back pain [25]. Physical activity is becoming more and more acknowledged for the prevention of various kinds of morbidity. Preventive effects on unspecific back symptoms and absence from work have been demonstrated [6].

Among the lifestyle variables studied, snuff use and sedentary leisure time were associated with sick leave during follow up. In a previous analysis of the same study population, we found that snuff use independently predicted a disability pension owing to neck or low back pain in the entire cohort, irrespective of the presence or absence of previously reported symptoms [12]. We have found no other study dealing with snuff use and sickness absenteeism and very few on musculoskeletal symptoms or disorders in relation to snuff use [8]. The possible mechanism underpinning the association is unknown, but uncontrolled confounding with social or cultural factors is a possibility. With regard to the high and increasing use of snuff in Sweden, further studies concerning possible health consequences are needed.

In conclusion, we found that the lifestyle factors of snuff use and sedentary leisure time were significant predictors of sick leave owing to neck and low back pain, while occupational factors other than type of employment had no impact among middle aged rural men. The low risk of sick leave among the self-employed is noteworthy. Enhanced understanding of the mechanisms behind this finding would be of interest from social and public health perspectives.

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