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ORIGINAL ARTICLE

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Work factors as predictors of smoking relapse in nurses' aides

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Abstract *Objectives:* The prevalence of tobacco smoking in nurses' aides (assistant nurses) is high. Many smokers make attempts to stop smoking, but a large portion of these relapse after some period of time. The objective of this study was to identify work factors that predict smoking relapse in nurses' aides. *Methods:* Of 1,373 Norwegian nurses' aides—who were former smokers, not current smokers, and not on leave when they completed a questionnaire in 1999—1,203 (87.6%) filled in a second questionnaire 15 months later. A wide spectrum of physical, psychological, social, and organisational work factors were assessed by validated questionnaires at baseline. Respondents who reported smoking at least one cigarette per day at the follow-up were considered having resumed daily smoking (relapse). *Results:* Social climate in the work unit (index with 3 items: supportive, trustful, relaxed) and frequency of exposure to threats and violence were the only work factors that were associated with the occurrence of relapse after adjustments for background factors. In a logistic regression analysis, frequent exposure to threats and violence at work (odds ratio (OR) = 2.08; 95% confidence interval (CI): 1.01–4.29), and the lowest quintile of the social climate index (OR = 2.12; CI: 1.03–4.36) were associated with increased risk of smoking relapse, after adjustments for age, gender, marital status, and having preschool children. *Conclusions:* A poor social climate in the work unit and frequent exposure to threats and violence at work may be predictors of smoking relapse in nurses' aides. It is essential that leaders in the health services put more emphasis on creating a supportive, relaxed, and trustful social climate in the work unit. It is also important that protective measures against violent patients are implemented, and that occupational health officers offer victims of violence appropriate support or therapy.

Keywords Smoking · Smoking cessation · Workplace · Social environment · Nurses' aides

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Introduction

The prevalence of tobacco smoking in nursing personnel remains high [14, 22]. In Norway, the situation among nurses' aides (assistant nurses) is particularly worrying; more than 40% of Norwegian nurses' aides are daily smokers [14], in sharp contrast to female physicians, with a prevalence lower than 10% [50].

Many smokers make attempts to stop smoking [28, 33]. Unfortunately, a large portion of these relapse after some period of time [19, 27, 28]. Research during recent decades has provided extensive knowledge of the factors that maintain regular smoking, including pharmacological, genetic, psychological, and social factors [4–6, 8, 17, 21, 25, 31, 38, 44]. Even so, investigators have recently argued that effective prevention of relapse will require that we obtain a better understanding of the forces behind relapse [37].

The effects of working conditions on people's health and health-related behaviour are complex [10]. The Demand-Control Model, proposed by Robert Karasek in [23], is one of the best documented theories in this field. This model maintains that the effects of demands depend on possibilities for control, and it assumes that adverse health effects occur when a worker is exposed to a combination of high demands and low control. Many studies indicate that this model may help explain the development of stress-related medical conditions [29, 36, 46].

The relationship between working conditions and occurrence of smoking relapse has been examined in some studies [41, 45, 48, 49]. Wewers [48] studied 150 individuals who had quit smoking three months earlier while they were enrolled in smoking cessation clinics in

Maryland, USA. Participants who were still abstinent reported having had fewer work-related stressful events during the 3 months since cessation. Sloan and coworkers [41] studied 73 employees at the Volvo company in Sweden, participating in a lottery quit-smoking contest. No difference was found between those who were still abstinent and those who had relapsed at the 12-month follow-up with respect to level of psychological stress at work or number of working hours per week. Swan and coworkers [45] studied 329 ex-smokers from California who had maintained abstinence for at least 3 months after having participated in smoking cessation programs. Surprisingly, individuals who reported high work strain were less inclined to relapse during the successive 12 months than those who reported low work strain. In a study of 100 full-time employees in the USA, who had stopped smoking while they participated in a smoking cessation program, Wevers and Ahijevych [49] found that high workload, high level of role ambiguity at work, and low income were associated with increased risk of having relapsed 1 year after the quit attempt. Surprisingly, high level of social support from coworkers was associated with increased risk of relapse. They found no association between abstinence at 12-month follow-up and the level of role conflicts at work, responsibility in the job, underutilisation of abilities, and participation in decisions at work.

As the review above shows, earlier studies of the relationship between working conditions and smoking relapse have been based on relatively small convenience samples. Most studies have focused on a small number of work factors. Leadership behaviour, organisational climate, and exposures to bullying, threats and violence at work have not been examined in this context. Only ex-smokers who have attended cessation clinics or participated in special cessation programs have been examined, whereas the great majority of those who stop or attempt to stop smoking do it without help [16]. No studies have focused on smoking relapse in nursing personnel.

The aim of the present study was to identify work factors that predict resumption of daily smoking in nurses' aides who are former smokers. As high demands, frequent role conflicts, low control, low social support, unfair leadership, exposure to bullying, and exposure to threats and violence at work are likely to evoke negative emotions in workers [9, 11, 29, 39, 40], we hypothesised that these factors also might cause smoking relapse. Organisational climate [30] has been postulated to act as a source of influence for shaping behaviour [30], and we hypothesised that organisational climate also would be related to the risk of smoking relapse.

Methods

Data collection and participants

The great majority of vocationally active nurses' aides in Norway, about 50,000 individuals, were members of the Norwegian Union of Health - and Social Workers (the Union) in 1999 (Norwegian Union of Health - and Social Workers, personal communication). During the last week of October, 1999, 12,000 nurses' aides were drawn randomly from the Union's list of members, and were mailed a comprehensive questionnaire. The objective was to study working conditions, lifestyle, and health. After one reminder, 7,478 (62.3%) consented to participate and filled in the questionnaire. The inclusion criteria of the present study were: (1) being vocationally active and not on leave because of illness or pregnancy at baseline; (2) reporting at baseline that they were not daily smokers; (3) reporting at baseline that they had been daily smokers earlier (i.e. at least one cigarette per day for 3 months). Of the 1,373 nurses' aides who fulfilled these criteria, 1,203 (87.6%) filled in a second postal questionnaire 15 months later. The characteristics of respondents and dropouts are presented in Table 1.

Research protocol was approved by the Committee for Medical Research Ethics, and the study was performed in accordance with the ethical standards in the 1964 Declaration of Helsinki. Informed written consent was given by the respondents.

Measures of smoking

At baseline, respondents were asked 'Have you ever smoked daily (i.e. at least 1 cigarette per day for 3 months)?' and 'How many cigarettes do you smoke per day now?' Those who answered 'yes' to the first question (optional answers: yes and no) and '0 cigarettes per day' to the second question (optional answers: 0; 1–9; 10–19; 20 or more), were included in the present study.

At follow-up (as at baseline), the nurses' aides were asked 'How many cigarettes do you smoke per day now?' Respondents who reported that they were smoking 1–9, 10–19, or 20 or more were considered having resumed daily smoking (hereafter referred to as relapse). The outcome measure was the occurrence of relapse.

Measures of working conditions

At baseline, a series of work factors, including type of ward (e.g. psychiatric department), number of working hours per week, and frequency of night shift, were recorded. Exposure to heavy physical work was measured with three questions exploring frequency of moving patients manually in bed, frequency of lifting or supporting patients manually between bed and chair, and frequency of lifting, carrying, or pushing heavy objects. The first two questions were translations of questions developed and found valid by British scientists [42]. The subjects were also asked to report the extent to which their job required physical endurance.

Psychological, social, and organisational work factors were assessed by questions from the General Nordic

Table 1 Baseline characteristics of respondents and dropouts

Characteristics at baseline	Respondents ($N = 1,203$)		Dropouts ($N = 170$)	
	n	Column %	*n*	Column %
Gender				
Male	34	2.8	5	2.9
Female	1169	97.2	165	97.1
Age				
< 30	52	4.3	20	11.8
30–39	195	16.2	39	22.9
40–49	517	43.0	60	35.3
50–59	385	32.0	40	23.5
> 59	54	4.5	11	6.5
Marital status				
Married or cohabiting	1,048	87.2	139	81.8
Single	154	12.8	31	18.2
Have preschool children				
No	1,028	86.9	144	86.7
Yes	155	13.1	22	13.3

Questionnaire for Psychological and Social factors at Work (QPSNordic) [10]. There were questions exploring quantitative work demands, positive challenges, role conflicts, control of work pace, participation in important decisions, social support from immediate superior, fairness of immediate superior's leadership, social climate in the work unit, rewards for well-done work, exposure to threats or violence, and exposure to bullying. Responses were scored on Likert five-point frequency scales, except responses to the question about bullying, which had only two response options (yes and no) after a precise definition of the concept. The indices were calculated as the mean of the item scores, and these indices were then divided into quintiles. Test–retest reliability (5–8 weeks) of the indices have all been found to be higher than 0.72 (Pearsons' *r*) [10]. Test–retest reliabilities of the single item instruments were not reported. In the present study the internal consistency (Cronbach's alpha) of the indices were in the range of 0.68 to 0.88, except the index of control over work pace (0.57).

At follow-up, the respondents were asked whether they had changed work or work tasks after they completed the first questionnaire.

Measures of background factors

At baseline, age, gender, and a series of factors related to the private sphere, including marital status, number of preschool children (< 6 years), and pregnancy, were recorded, as described elsewhere [14].

Statistical analyses

Statistical analyses were conducted with the Statistical Package for Social Sciences (SPSS) version 11.0. Chi-square tests and logistic regression analyses were used to examine the relationship between work factors and the occurrence of smoking relapse. All work factors that had been measured (see above) were examined one at a time as potential predictors of relapse. Age, gender, marital status, and having small children have been related to smoking behaviour or changes in smoking behaviour in other studies [13, 15] and may also influence the perception and cognitive appraisal of working conditions. Hence, they were á priori seen as obligatory control variables (adjustment factors). Number of pregnant individuals were so few that the variable 'pregnancy' was not included among obligatory variables. All work factors that were significantly related to the risk of relapse after adjustments for the obligatory control variables, were entered in the most complex logistic regression model together with the obligatory control variables. In these logistic regression analyses, the category that was expected to be associated with the lowest risk of relapse was chosen as a reference category.

Supplementary analyses were conducted in order to test the Demand-Control Model. For use in these analyses, an aggregated job strain variable, a demand-control ratio, was constructed by dividing the index of quantitative work demands by the sum of the following two indices: control of work pace and participation in important decisions. This ratio was then divided into quartiles. A similar procedure has been used by others [36], and the division of the ratio into quartiles was done to ease the comparison with these studies.

When many comparisons are conducted, the nominal *P* values for each variable may be misleading, because the risk of type I error cumulates with each statistical test performed [20]. There is, however, no fully satisfactory way of correcting *P* values in studies like the present one, with many variables that are intercorrelated [1, 20]. In such cases, the correcting procedures are too conservative. It is also important to acknowledge that implementation of multiple comparison procedures has a philosophical component, involving a researcher's position on the balance between statistical power and control over Type I error [20]. We found it appropriate

Table 2 The occurrence of smoking relapse, by work factors at baseline. The figures are numbers, proportions, and odds ratios

Work factors	*N*	*n* (row %)	Adj OR (CI)	
			Model 1	Model 2
Quantitative work demands [a] (Mean = 2.87; SD = 0.75)				
1 (*r*)	307	23 (7.5)	1.00	
2	109	9 (8.3)	1.11 (0.49–2.53)	
3	301	21 (7.0)	0.89 (0.47–1.66)	
4	274	25 (9.1)	1.23 (0.67–2.24)	
5	175	14 (8.0)	1.11 (0.55–2.23)	
Positive challenges in the job [a] (Mean = 3.87; SD = 0.69)				
1	164	17 (10.4)	1.20 (0.59–2.44)	
2	359	24 (6.7)	0.73 (0.38–1.40)	
3	245	15 (6.1)	0.63 (0.31–1.30)	
4	190	17 (8.9)	1.01 (0.50–2.05)	
5 (*r*)	209	19 (9.1)	1.00	
Control of work pace [a] (Mean = 2.35; SD = 0.81)				
1	187	19 (10.2)	1.37 (0.64–2.91)	
2	296	21 (7.1)	0.99 (0.48–2.07)	
3	207	15 (7.2)	1.00 (0.45–2.21)	
4	308	24 (7.8)	1.01 (0.49–2.08)	
5 (*r*)	172	13 (7.6)	1.00	
Participation in decisions at work [a] (Mean = 3.33; SD = 0.77)				
1	161	15 (9.3)	1.15 (0.58–2.29)	
2	354	24 (6.8)	0.89 (0.49–1.61)	
3	192	10 (5.2)	0.67 (0.31–1.45)	
4	164	18 (11.0)	1.43 (0.74–2.76)	
5 (*r*)	299	25 (8.4)	1.00	
Level of role conflicts [a] (Mean = 2.30; SD = 0.78)				
1 (*r*)	210	11 (5.2)	1.00	
2	299	27 (9.0)	1.71 (0.80–3.66)	
3	180	11 (6.1)	1.02 (0.42–2.49)	
4	340	31 (9.1)	1.61 (0.76–3.40)	
5	140	12 (8.6)	1.54 (0.64–3.71)	
Social climate in the work unit [a] (Mean = 3.99; SD = 0.71)				
1	151	19 (12.6)	2.33 (1.15–4.75) *	2.12 (1.03–4.36) *
2	284	21 (7.4)	1.27 (0.64–2.51)	1.23 (0.62–2.44)
3	238	17 (7.1)	1.13 (0.55–2.33)	1.06 (0.51–2.21)
4	224	19 (8.5)	1.53 (0.76–3.08)	1.49 (0.74–3.01)
5 (*r*)	271	16 (5.9)	1.00	1.00
Exposure to threats and violence at work (previous 2 years)				
Never or very seldom (*r*)	709	47 (6.6)	1.00	1.00
Rather seldom	160	14 (8.8)	1.31 (0.70–2.47)	1.29 (0.68–2.43)
Sometimes	213	19 (8.9)	1.18 (0.67–2.10)	1.16 (0.65–2.08)
Rather often/very often	84	11 (13.1)	2.07 (1.01–4.25) *	2.08 (1.01–4.29) *
Exposure to bullying at work (previous 6 months)				
No (*r*)	1,135	86 (7.6)	1.00	
Yes	32	6 (18.8)	2.26 (0.83–6.18)	
Fairness of the immediate superior's leadership [a] (Mean = 4.14; SD = 0.80)				
1	232	18 (7.8)	1.02 (0.53–1.96)	
2	123	9 (7.3)	0.86 (0.38–1.95)	
3	372	31 (8.3)	1.10 (0.62–1.95)	
4	125	10 (8.0)	1.06 (0.48–2.31)	
5 (*r*)	320	24 (7.5)	1.00	
Support from immediate superior [a] (Mean = 3.88; SD = 0.99)				
1	181	21 (11.6)	1.58 (0.82–3.03)	
2	312	23 (7.4)	1.00 (0.53–1.88)	
3	162	11 (6.8)	0.84 (0.39–1.84)	
4	245	17 (6.9)	0.87 (0.44–1.73)	
5 (*r*)	269	20 (7.4)	1.00	

In Model 1, each work factor was adjusted for age, gender, marital status, and having a preschool child. In Model 2, the following factors were entered in the analysis: age, gender, marital status, having a preschool child, and the two work factors that were significantly related to relapse in Model 1

r, Reference category in the logistic regression analyses; *SD*, standard deviation; *N,* Total number of individuals in each category; *n* Number of individuals in each category who had relapsed at follow-up; *Row* %, Proportion of individuals in each category who had relapsed at follow-up; *Adj OR (CI)*, Adjusted odds ratio (95 % confidence interval) in logistic regression analysis

* $P < 0.05$

[a] The categories are quintiles (1 represents the lowest level of the index and corresponds with the lowest quintile)

not to reduce the statistical power by including conservative correcting procedures, and chose to use the traditional statistical significance level: 0.05.

Results

Of the 1,203 individuals who responded at follow-up, 29 did not answer the question about smoking. These 29 persons reported less handling of heavy objects at work than those who answered the question about smoking at follow-up (data not shown). Of the 1,174 who answered the question about smoking at follow-up, 92 (7.8%) reported that they were smoking one cigarette per day or more (i.e. had relapsed).

Social climate in the work unit (index with 3 items: supportive, trustful, relaxed) and frequency of exposure to threats and violence were the only work factors that were associated with the occurrence of relapse after adjustments for age, gender, marital status, and having a preschool child (Table 2). The level of the social climate factor that corresponded with the lowest quintile of the index was associated with increased risk of relapse (odds ratio (OR) = 2.12; 95% confidence interval (CI): 1.03–4.36), also after adjustments for the frequency of threats and violence at work, age, gender, marital status, and having a preschool child. The reporting of rather often or very often exposure to threats and violence at work during the previous 2 years was associated with increased risk of relapse (OR = 2.08; CI: 1.01–4.29), also after adjustments for the social climate in the work unit, age, gender, marital status, and having a preschool child.

Supplementary analyses showed that the occurrence of relapse in respondents with the highest level of demand-control ratio was not significantly different from the occurrence of relapse in respondents with the lowest level of demand-control ratio (10.8% vs. 8.2%), also after adjustments for age, gender, marital status, and having a preschool child (OR = 1.34; CI: 0.75–2.38).

Discussion

In this 15-month prospective study of nurses' aides, who were all former smokers, the reporting of frequent exposures to threats and violence at work and the reporting of lack of supportive, trustful, and relaxed social climate in the work unit were associated with increased risk of smoking relapse. No earlier studies have explored how threats and violence at work and the social climate in the work unit are related to smoking relapse.

Threats and violence at work are common in Western societies, and nursing personnel are more frequently exposed than many other occupational groups [3]. There is substantial overlap between those reporting direct physical assaults and those reporting threats [2]. The vast majority of violent episodes directed toward health care personnel do not result in serious physical injury [35], but these frightening events may have serious psychological consequences, such as posttraumatic stress disorder [9]. Long-term or easily activated fear of recurring violence is one of the primary ways that victims of workplace violence react to the traumatic event [40]. Such emotional effects could explain the association between exposure to threats and violence at work and the risk of smoking relapse in the present study. Arnetz et al. [2] found an association between exposure to threats at work and the prevalence of smoking in Swedish nurses.

Organisational climate may be defined as "a relatively enduring characteristic of an organization which distinguishes it from other organizations, and embodies members' collective perceptions about their organization with respect to such dimensions as autonomy, trust, cohesiveness, support, recognition, innovation, and fairness" [30]. According to Moran and Volkwein [30], organisational climate reflects the prevalent norms, values, and attitudes of the organisation's culture, and acts as a source of influence for shaping behaviour. In the present study, we focused on three aspects of the organisational climate, that is, the extent to which the work unit was perceived as supportive, trustful, and relaxed. Social support at work is associated with less affective symptoms [29], and it seems likely that trust and relaxedness at work may have some of the same effects as well. Increased risk of experiencing negative emotions could therefore explain why nurses' aides who scored low on social climate index had increased risk of relapse.

Considering the fact that both high demands and low control are likely to evoke negative emotions [29], one would expect these factors to increase the risk of smoking relapse as well. One may therefore ask as to why these factors, not even the demand-control ratio, were not related to the relapse rates in this study. One explanation may be that nurses' aides with high job strain are less likely to take breaks during the work shift, and consequently are less often exposed to colleagues' smoking, a strong temptation to former smokers [8]. As many nurses' aides are smoking, smoking is often taking place during these breaks. One should also take into account that predictions of health using information about psychosocial work conditions tend to be more successful for men than for women [46], perhaps because the total psychological load in women interacts more with the home situation. Swan and coworkers [45] found that individuals who reported high work strain had a reduced risk of relapse during the successive 12 months.

The majority of relapses occur during the first few weeks of the quit attempt, and studies that follow quitters from the very start of abstinence typically find 12-month relapse rates around 80% [19, 27]. Swan et al. [45], who studied former smokers who had maintained abstinence for at least 3 months, reported that one-third had relapsed 12 months later. Krall et al. [26] studied former smokers who had maintained abstinence for at least 2 years, and found that relapse rates in the succeeding years fluctuated between 2 and 4% per year. In

the present study, 8% had resumed daily smoking at follow-up. Such a low relapse rate was to be expected; when all former smokers at a given point of time are included in the sample, as it was here, the average length of the abstinence periods will be relatively long [18]. The length of the abstinence periods were not recorded, though.

Response rate in the first data collection was not optimal (62%). On the other hand, number of dropouts between baseline and the follow-up was low (12%).

Validity and reliability of self-reported work factors have been explored and discussed by several authors. Some authors [24] have found high correlations and others [32, 43] have found fair or modest correlations between 'objective' and self-reported information on psychosocial work environment. Few psychological aspects of the work situation may be measured objectively, though. Intermethod surveys indicate that self-reports have acceptable validity for gross activities in the job [7, 42, 47]. The instruments in the present study that were used to measure psychosocial and organisational work factors were questions from the QPSNordic [10]. These indices have been found to have good construct and predictive validity as well as good internal consistency and test–retest reliability. The questions used to assess the frequency of patient handling were found to have good validity in a British study [42].

In clinical trials of smoking interventions, the social pressure felt by the participants against smoking is relatively strong, and biochemical validation procedures may be needed to ensure correct measures of the participants' smoking status [34]. However, in observational studies, such as the present one, people seem to report reliably whether they smoke or not [34].

One should keep in mind that the associations that were found may partly be due to background factors for which we were not able to adjust. Potential confounders include alcohol consumption, personality traits (e.g. negative affectivity), degree of nicotine addiction before cessation, and colleagues' smoking behaviour. It is also possible that psychological stress outside the workplace, such as marital conflicts and economic worries, may have influenced both relapse rates and the reporting of working conditions, and consequently may have influenced the results of the present study. On the other hand, the relative homogeneity of the cohort in educational attainment and occupation may serve to enhance the internal validity of this study, as confounding by these factors may pose a problem in studies in which different occupational groups participate.

In conclusion, a poor social climate in the work unit and frequent exposure to threats and violence at work may be predictors of smoking relapse in nurses' aides. It is essential that leaders in the health services put more emphasis on creating a supportive, relaxed, and trustful social climate in the work unit. It is also important that protective measures against violent patients are implemented, and that occupational health officers offer victims of violence appropriate support or therapy.

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