

S M O K I N G

Do people who were passive smokers during childhood have increased risk of long-term work disability?

A 15-month prospective study of nurses' aides

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Background: Regular inhalation of tobacco smoke, whether it be voluntary or not, may have profound negative effects on the body. Also intervertebral discs may be affected. The objective of the present study was to test the hypothesis that nurses' aides who were exposed to environmental tobacco smoke (ETS) at home during childhood have an increased risk of long-term sick leave. **Methods:** The sample comprised 5563 Norwegian nurses' aides, not on sick leave when they completed a mailed questionnaire in 1999. Of these, 4744 (85.3%) completed a second questionnaire 15 months later. The outcome measure was the incidence proportion of long-term sick leave during the 12 months prior to the follow-up. **Results:** Respondents who reported at baseline that they had been exposed to ETS at home during childhood had increased risk of sick leave exceeding 14 days attributed to neck pain (odds ratio (OR) = 1.34; 95% confidence interval (CI): 1.04–1.73), high back pain (OR=1.49; CI: 1.07–2.06), low back pain (OR=1.21; CI: 0.97–1.50), and any illness (OR=1.23; CI: 1.07–1.42), after adjustments for demographic and familial characteristics, former smoking, current smoking, physical leisure-time activities, work factors, prior neck injury, and affective symptoms. They also had increased risk of sick leave exceeding 8 weeks (OR=1.29; CI: 1.08–1.55). **Conclusion:** The study supports the hypothesis that nurses' aides who were exposed to ETS at home during childhood have an increased risk of long-term sickness absence.

Keywords: childhood, nurses' aides, pain, sick leave, tobacco smoke pollution

Sickness absence, particularly long-term absence, represents a major problem in Western societies.¹ Reduced functional ability and the associated social isolation cause human suffering, and the economic costs to industry and the community at large are substantial. Nurses' aides, the main providers of practical patient care in the health service, are one of the occupational groups that exhibit high absence rates.²

The reasons for sickness absence are complex.^{1,3} The causes of an illness may be numerous, and an ill person's ability to work and decision to be absent from work are determined not only by the severity of the health problem, but by a series of social, psychological, and physical factors. The impact of childhood exposures on rates of sickness absence remains unclear.

A large body of literature shows that tobacco smoking may have profound negative effects on the body.⁴ Also intervertebral discs may be affected.^{5,6} Not unexpectedly, smokers have increased rates of sickness absence.^{7,8}

Several studies indicate that exposure to environmental tobacco smoke (ETS) may have the same effects on the body as small quantities of voluntarily inhaled tobacco smoke.^{9–11} Adults who are regularly exposed to ETS seem to have increased risk of both heart disease and lung cancer.^{9–11} Passive smoking at work has been reported to be associated with increased rates of sickness absence.¹²

Children who are exposed to ETS at home are more often bothered by unspecific upper respiratory symptoms, wheezing, lower respiratory infections, and middle ear effusion.⁹ They are also more likely to develop life-long respiratory health problems in the form of asthma,^{13,14} and may have an increased risk of

developing lung cancer as adults.¹⁵ No studies seem to have explored the extent to which exposure to ETS during childhood is related to work disability during adulthood.

The objective of the present study was to test the hypothesis that nurses' aides who were exposed to ETS at home during childhood have an increased risk of long-term sick leave.

METHODS

Design and sampling

The study had a prospective cohort design. The Norwegian Union of Health – and Social Workers organizes the great majority of the certified nurses' aides in Norway. In 1999, a random sample of the nurses' aides organized in this union were mailed a questionnaire. After one reminder, 7478 of 12000 (62.3%) completed and returned the questionnaire. The sample of the present study comprised the 5563 responders who were working more than 18 hours per week (i.e. more than half-time job), and who were not on leave because of illness or pregnancy at baseline. Of these, 4744 (85.3%) completed a second questionnaire 15 months later.

Outcome measure

At the 15 month follow-up, the nurses' aides were asked whether they had been absent from work because of illness for more than 14 consecutive days during the previous 12 months. Those who answered 'yes' were asked about the cause of the absence. Optional answers were: headache; neck pain; high back pain; low back pain; shoulder pain; pain in elbow, wrist, or hand; pain in hip, knee, ankle, or foot; other disease or illness. The nurses' aides were also asked whether they had been absent from work because of illness for more than 8 consecutive weeks during the previous 12 months. Those who answered 'yes' were asked about the cause of the absence. Optional answers were: low back pain; other disease or illness. The questions were supplemented by a 'pain-region drawing'.

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The main outcome measures were the incidence proportion of sick leave lasting longer than 14 days and the incidence proportion of sick leave lasting longer than 8 weeks during the 12 months prior to follow-up. Incidence proportion of sick leave was defined as the proportion of respondents with one or several periods of sick leave during the 12 month observation period.

Independent variables

At baseline, subjects were asked if their parents smoked at home during the subjects' childhood. Optional answers were: no; sometimes; often. The subjects were also asked if they had ever been daily smokers (i.e. at least one cigarette per day in 3 months), and how many cigarettes they were smoking per day now. At baseline, demographic and familial characteristics, physical leisure-time activities, work and work-related factors, whether the subjects ever had injured the neck in an accident, and health complaints were recorded, as described in detail elsewhere.¹⁶

Ethics

The research protocol was approved by the Committee for Medical Research Ethics in Health Region II. Informed written consent was given by the responders.

Statistical analyses

Statistical analyses were conducted with the Statistical Package for Social Sciences (SPSS) version 6.1. Chi-square tests and logistic regression analyses were used. Logistic regression analyses were performed to adjust for potential confounders of the relationship between reported exposure to ETS during childhood and the outcome measures. Three logistic regression models were tested. In the first model, adjustments were made for age and gender. In the second model, adjustments were made for age, gender, marital status, number of preschool children, former smoking, daily consumption of cigarettes, physical leisure-time activities, having injured the neck in an accident, number of working hours per week, quantitative work demands, and personal commitment to the work unit. In the third and most comprehensive model, adjustments were made for the same factors as in the second model, and level of affective symptoms. Baseline health complaints were not included in the models because these variables were in an intermediary position between the main explanatory variable and the outcome measures. The level of affective symptoms was included, though, because mental health may reflect the psychosocial environment at home during childhood, which is an important confounder of the relationship that was studied here. All factors in the models were entered in the analyses simultaneously.

RESULTS

Respondents' characteristics

Table 1 shows baseline characteristics of those who responded to both questionnaires (hereafter referred to as respondents) and those who dropped out between baseline and follow-up. There was no difference between respondents and dropouts with respect to self-reported exposure to environmental tobacco smoke during childhood ($p=0.18$). The respondents were older, were more often married or cohabiting, were more often non-smokers, worked fewer hours per week, and were less bothered by affective symptoms at baseline than the dropouts.

At the follow-up, 1609 subjects (34.5%) reported that they had had one or several periods of sick leave lasting longer than 14 days during the previous 12 months, whereas 818 (17.7%) reported having had sick leave lasting longer than 8 weeks.

Relationship of background factors to passive smoking during childhood and sickness absence: univariate analyses

Respondents who reported that they had been exposed to ETS during childhood were less often older than 54 years, and were

more often heavy smokers than those who reported that they had not been exposed to ETS during childhood (table 2).

Age, daily consumption of cigarettes, having injured the neck in an accident, all recorded health complaints, and most recorded work factors were associated with the 12-month incidence proportion of long-term sickness absence in univariate analyses (data not shown).

Passive smoking during childhood and all-cause sickness absence

Respondents who reported at baseline that they had been exposed to ETS at home during childhood had an increased risk of sick leave exceeding 14 days (odds ratio (OR)=1.23; 95% confidence interval (CI): 1.07–1.42) and an increased risk of sick leave exceeding 8 weeks (OR=1.29; CI: 1.08–1.55), after adjustments for demographic and familial characteristics, former smoking, daily consumption of cigarettes, physical leisure-time activities, work factors, having injured the neck in an accident, and level of affective symptoms (table 3). There were signs of a dose-response relationship between reported exposure to ETS during childhood and the risk of long-term sick leave. The odds ratios varied little between the different logistic regression models (data not shown). Preliminary logistic regression analyses showed that the interaction terms 'exposure to ETS during childhood \times age' and 'exposure to ETS during childhood \times ever smoking' were not associated with the risk of long-term sick leave (data not shown).

Passive smoking during childhood and cause-specific sickness absence

Analyses of cause-specific sick leave exceeding 14 days showed that reported exposure to ETS at home during childhood was associated with an increased risk of sick leave attributed to neck pain (OR=1.34; CI: 1.04–1.73) and high back pain (OR=1.49; CI: 1.07–2.06), after adjustments for demographic and familial characteristics, former smoking, daily consumption of cigarettes, physical leisure-time activities, work factors, having injured the neck in an accident, and level of affective symptoms (table 4). There was an association of borderline significance between reported exposure to ETS at home during childhood and the risk of sick leave attributed to low back pain (OR=1.21; CI: 0.97–1.50; $p=0.09$) (table 4). There was no association between reported exposure to ETS at home during childhood and the risk of sick leave attributed to headache (OR=1.09; CI: 0.78–1.53), shoulder pain (OR=1.21; CI: 0.95–1.53), distal arm pain (OR=1.00; CI: 0.75–1.33), lower extremity pain (OR=1.18; CI: 0.92–1.50), and illnesses other than musculoskeletal pain (OR=0.99; CI: 0.83–1.18).

Analyses of cause-specific sick leave exceeding 8 weeks showed that reported exposure to ETS at home during childhood was associated with an increased risk of sick leave attributed to illnesses other than low back pain (OR=1.23; CI: 1.02–1.48), after adjustments for demographic and familial characteristics, former smoking, daily consumption of cigarettes, physical leisure-time activities, work factors, having injured the neck in an accident, and level of affective symptoms. There was a non-significant trend for respondents who reported exposure to ETS during childhood to report more sick leave attributed to low back pain (OR=1.21; CI: 0.93–1.59; $p=0.15$).

DISCUSSION

In this 15-month prospective study of Norwegian nurses' aides, subjects who reported that they had been exposed to ETS at home during childhood had an increased risk of long-term sickness absence, especially sickness absence attributed to spinal pain, after adjustments for a series of background factors. One explanation may be that harmful effects of ETS during childhood cause work disability during adulthood. Exposure to

ETS during childhood may contribute to the development of asthma bronchiale,^{13,14} and perhaps also to the development of lung cancer later in life.¹⁵ However, asthma and lung cancer contribute only to a small extent to the total incidence of long-term sick leave.¹⁷ The most common reasons for long-term sick leave in the general working population, and even more so in nurses' aides, are musculoskeletal disorders.¹⁷ In the present study, reported exposure to ETS during childhood was associated with an increased risk of long-term sick leave attributed to spinal pain, such as neck pain and back pain. Whether these associations represent causal effects remains unclear, but they could be due to effects of ETS on the developing spine. In several studies, smoking has been associated with the occurrence of spinal pain; mostly low back pain, but also neck pain and prolapsed cervical intervertebral discs.¹⁸⁻²³ Other studies suggest that regular inhalation of tobacco smoke may lead to reduced perfusion and malnutrition of intervertebral discs.^{5,6} The pathophysiological processes that evoke neck pain and back pain are often unclear, but it is well documented that disc pathology, in the form of herniated discs or internal disc disruptions, may be involved in

serious cases.^{24,25} If the development of intervertebral discs during childhood and adolescence is impeded by reduced perfusion due to regular inhalation of ETS, it could perhaps lead to intervertebral discs that are vulnerable to mechanical and biochemical stress, causing spinal disorders and pain.

One should bear in mind, though, that the associations in the current study could have been caused by background factors for which we were not able to adjust. The psychosocial environment at home during childhood is one potential confounder.^{26,27} Insecure childhood may result in mental problems and alcohol abuse, and subsequently sickness absence. The association between exposure to ETS at home during childhood and the occurrence of long-term sickness absence remained significant after adjustments for baseline level of affective symptoms, but we were not able to adjust for alcohol consumption or prior mental problems. 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; confounding by these factors may pose a problem in studies in which different occupational groups participate.

Table 1 Baseline characteristics of the respondents and the dropouts at baseline

Baseline characteristics	Respondents		Dropouts		Baseline characteristics	Respondents		Dropouts	
	n	Col %	n	Col %		n	Col %	n	Col %
Age					Physical leisure-time activity ^a				
<25	67	1.4	49	6.0	No regular exercise	1,198	25.3	215	26.3
25-29	223	4.7	87	10.6	Slow walks	867	18.3	155	18.9
30-34	302	6.4	92	11.2	Brisk walks	1,027	21.6	153	18.7
35-39	589	12.4	110	13.4	Aerobics or gym	270	5.7	51	6.2
40-44	983	20.7	148	18.1	Other activities or combinations	1,382	29.1	245	29.9
45-49	1,013	21.4	140	17.1	Long-term health problems (any kind)				
50-54	910	19.2	106	12.9	No problem	3,085	65.8	538	66.3
55-59	463	9.8	52	6.3	Yes, but not bothered	352	7.5	72	8.9
60-64	169	3.6	27	3.3	Yes, somewhat bothered	919	19.6	149	18.4
>64	24	0.5	8	1.0	Yes, a lot bothered	336	7.2	52	6.4
Gender					Affective symptoms ^b				
Female	4,558	96.1	774	94.9	1 and 2	2,044	43.4	317	39.4
Male	186	3.9	42	5.1	3	902	19.2	125	15.5
Civil status					4	855	18.2	161	20.0
Married or cohabiting	3,818	80.6	616	75.5	5 (highest quintile)	908	19.3	202	25.1
Single	921	19.4	200	24.5	Neck pain ^b				
Work hours per week					No	2,189	46.2	371	45.4
19-36	4,067	85.7	677	82.7	A little	1,499	31.6	246	30.1
>36	677	14.3	142	17.3	Rather intense	798	16.8	157	19.2
Exposure to environmental tobacco smoke during childhood					Very intense	257	5.4	44	5.4
No	1,422	30.1	220	27.0	High back pain ^b				
Yes, sometimes	1,345	28.4	236	29.0	No	3,441	72.5	594	72.6
Yes, often	1,961	41.5	359	44.0	A little	782	16.5	127	15.5
Smoking					Rather intense	392	8.3	74	9.0
Never smoker	1,704	36.0	275	33.8	Very intense	128	2.7	23	2.8
Former smoker	1,036	21.9	152	18.7	Low back pain ^b				
Smoke 1-9 cig/day	1,073	22.7	196	24.1	No	2,158	45.5	351	42.9
Smoke 10-19 cig/day	835	17.7	171	21.0	A little	1,538	32.4	262	32.0
Smoke >19 cig/day	79	1.7	20	2.5	Rather intense	762	16.1	146	17.8
					Very intense	285	6.0	59	7.2

Col = column

a: During the previous 3 months; b: During the previous 14 days.

The response rate in the first data collection was moderate (62%). However, the true response rate of the vocationally active subjects was probably higher. The list of members of the Norwegian Association of Health and Social Workers also includes retired persons, and contacts over telephone during the data collection gave the impression that many non-working subjects were not motivated to participate in the study. The cohort that was established in 1999 was most likely representative of vocationally active nurses' aides in Norway. Even so, people may have chosen not to participate in the study for reasons other than retirement or not currently working in the field. Some may have been off sick and therefore did not respond, and those who did

Table 2 Baseline characteristics in respondents who had been exposed, and those who had not been exposed to environmental tobacco smoke (ETS) at home during childhood

Baseline characteristics	Exposed to ETS during childhood			
	No N=1,422		Yes N=3,306	
	n	Column %	n	Column %
55 years or older	270	19.0	383	11.6
Male	53	3.7	133	4.0
Single	263	18.5	656	19.9
Smoke ≥10 cigarettes per day	175	12.4	738	22.4
No regular physical leisure-time activity	350	24.6	842	25.5
Work more than 36 hours per week	195	13.7	478	14.5
Long-term health problems	481	34.3	1,119	34.1
Highest level of affective symptoms	260	18.5	645	19.6
Usually or always fatigued	198	13.9	504	15.3
Bad sleep	130	9.2	298	9.1
Neck pain	755	53.1	1,792	54.2
High back pain	391	27.5	910	27.5
Low back pain	752	52.9	1,826	55.2

Table 3 The relationship between exposure to environmental tobacco smoke (ETS) at home during childhood, as reported at baseline, and the incidence proportion of long-term sick leave during the 12 months prior to the 15-month follow-up

Exposure to ETS at home during childhood	N	Sick leaves exceeding 14 days		Sick leaves exceeding 8 weeks	
		n (row %)	Adj OR (CI)	n (row %)	Adj OR (CI)
No	1,392	437 (31.4)	1.00	211 (15.3)	1.00
Yes, sometimes	1,326	469 (35.4)	1.23 (1.04–1.45)*	243 (18.6)	1.27 (1.02–1.57)*
Yes, often	1,926	698 (36.2)	1.24 (1.06–1.45)**	358 (18.8)	1.31 (1.08–1.60)**
No	1,392	437 (31.4)	1.00	211 (15.3)	1.00
Yes (sometimes or often)	3,252	1,167 (35.9)	1.23 (1.07–1.42)**	601 (18.7)	1.29 (1.08–1.55)**

The results of four logistic regression analyses.

N = the total number of subjects in each category (the numbers in the analyses of sick leaves exceeding 8 weeks were slightly lower).

n = the number of cases in each category.

Adj OR: odds ratio adjusted for age, gender, marital status, number of preschool children, former smoking, daily consumption of cigarettes, physical leisure-time activities, having injured the neck in an accident, number of work hours per week, quantitative work demands, personal engagement in the work unit, and level of affective symptoms.

CI = 95% confidence intervals. * p<0.05; ** p<0.01.

Table 4 The relationship between exposure to environmental tobacco smoke (ETS) at home during childhood, as reported at baseline, and the incidence proportion of cause-specific sick leaves exceeding 14 days during the 12 months prior to the 15-month follow-up

Exposure to ETS at home during childhood	N	Cause-specific sick leaves					
		Neck pain		High back pain		Low back pain	
		n (row %)	Adj OR (CI)	n (row %)	Adj OR (CI)	n (row %)	Adj OR (CI)
No	1,392	101 (7.3)	1.00	57 (4.1)	1.00	140 (10.1)	1.00
Yes, sometimes	1,326	122 (9.2)	1.37 (1.03–1.84)*	66 (5.0)	1.33 (0.91–1.96)	153 (11.5)	1.21 (0.94–1.56)
Yes, often	1,926	169 (8.8)	1.32 (1.00–1.74)*	114 (5.9)	1.60 (1.12–2.27)**	225 (11.7)	1.21 (0.95–1.53)
No	1,392	101 (7.3)	1.00	57 (4.1)	1.00	140 (10.1)	1.00
Yes (sometimes or often)	3,252	291 (8.9)	1.34 (1.04–1.73)*	180 (5.5)	1.49 (1.07–2.06)*	378 (11.6)	1.21 (0.97–1.50)***

The results of six logistic regression analyses.

N = the total number of subjects in each category.

n = the number of cases in each category.

Adj OR: odds ratio adjusted for age, gender, marital status, number of preschool children, former smoking, daily consumption of cigarettes, physical leisure-time activities, having injured the neck in an accident, number of work hours per week, quantitative work demands, personal engagement in the work unit, and level of affective symptoms.

CI = 95% confidence intervals. * p<0.05; ** p<0.01; *** p=0.09.

respond may have had more to say about the factors that contribute to sickness absence. Hence, selection bias in the first sample may have influenced the results.

The number of dropouts between the first and the second data collection was low (15%). There were some differences between respondents and dropouts, but no difference with respect to the reports of exposure to ETS during childhood or the prevalence of long-term health problems at baseline. It is not very likely that selection bias due to withdrawal between the two data collections explains the main finding in this study.

Occupational populations are selected populations, as unhealthy people are more likely to withdraw from the labour force. Assuming that people who have been exposed to ETS during childhood in fact have a poorer health (they are also more likely to be smokers) than those who were not exposed to ETS during childhood, they will also be more likely to withdraw from the labour force, and, hence, less likely to be represented in studies like the present one. If so, the associations in the present study between reported exposure to ETS during childhood and sickness absence may be weaker than the true associations.

Like all self-reports, and especially reports on events that have taken place a long time before the reporting, the reporting of exposure to ETS during childhood may be associated with recall bias. However, in earlier studies, good agreement has been found between adults' reports on exposure to ETS during childhood and surrogates' reports.^{28,29} Coultas *et al.* concluded that 'adults can reliably report whether household members smoked during their childhood, but information on quantitative aspects of smoking is reported less reliably'.²⁸

Studies have shown very good agreement between information from official registers and self-reported periods of certified sickness absence.^{30,31} Sick leave attributed to musculoskeletal disorders was reported as reliably as unspecific sick leave.^{30,31}

In conclusion, the study supports the hypothesis that nurses' aides who were exposed to ETS at home during childhood have an increased risk of long-term sickness absence. The results underline the importance of keeping children's environment free from tobacco smoke, and could increase smoking parents' motivation to cease smoking.

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