

CONNECTION BETWEEN SMOKING AND BACK PAIN – FINDINGS FROM AN ICELANDIC GENERAL POPULATION STUDY

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ABSTRACT. The association between pain in general, back pain and smoking was studied in a sample of subjects from the general public ($n=862$). The results show that smoking men had pain problems more frequently than women ($p < 0.0001$). In comparison with non-smokers, smokers were found to have back pains more frequently ($p < 0.01$). Male smokers were also found to have a higher frequency of intervertebral disc problems than female smokers ($p < 0.009$). The frequency of disc problems encountered by the smoking subjects indicates a possible connection between smoking and back pain.

Key words: risk factors, smoking, diagnostic interview schedule (DIS), epidemiology, back pain, pain.

During the past two decades many plausible risk factors for back pain (BP) have been suggested. Despite increasing concern in the industrialised Western world as to the effect of BP on the work force, the number of sufferers with BP has grown and their cost to the society has increased. In Iceland, during the period 1985–1987, BP accounted for 2.3 % of sick-leave absences (22). In Sweden, low back pain alone accounted for 13.5% of all the days in the year 1987 where sick-leave compensation was paid (29). If, in the Swedish example, the upper lumbar region of the back and the neck were included along with the low back, the total figure for sick-leave days where compensation was paid rose to 27.8%.

The scope of the present paper does not allow for an in-depth evaluation of all possible hypothesized risk factors for BP, the scope of which ranges from birth defects to some of the following: height, weight, age, gender, working conditions, stress, mental health, number of births, accidents, and lack of exercise (17). Instead we will dwell on a single factor, i.e. smoking, which has recently been shown to correlate quite frequently with BP. The earliest

reference quoting the connection between smoking and back pain was a unique study published by Gyltenberg (15) over 20 years ago, where he found that non-smokers seemed to have a slightly increased risk of BP compared with smokers ($p < 0.05$)! Many more studies on the issue have followed, all showing a positive connection between smoking and BP. Notable are the ones by Frymoyer et al. (13,14) as well as a number of prospective (e.g. 2,18,3,24, 5,23,33) and clinical ones (e.g. 4). All the latter studies uniformly show that the proposed connection may be valid.

Smoking has, however, not even been shown to be one of the causes of BP, any more than lifting heavy objects or incorrect posture when sitting. In attempts to link smoking to a specific action or occupation, Ryden and associates (28) made an unsuccessful trial to link smoking to a higher risk for work-related accidents and Boshuizen et al. (6) attempted to link it to a specific occupation, but proved unable to do so. In a recent publication on advances in idiopathic low back pain, Ernst (11) speculates on the means by which smoking may increase the risk of BP in smokers, i.e. whether smoking may cause malnutrition in the intervertebral disc, which in turn may leave it more vulnerable to mechanical stress. This is thought to be brought about by the constriction of fine arteries and the resultant decrease in blood flow due to nicotine use.

The goal of the present investigation was two-fold: [1] To examine whether pain problems suffered by smokers in a general population sample were more often centred in the back shown in other areas of the body; and [2] if the pain was more common in the back, whether it might lend support to the above stated hypothesis on smoking by Ernst (11), whereby smoking is labelled as one of the causal factors of BP. Because our epidemiological sample, described below, was large and included data pertaining to BP as well

as other pains, it provided a unique opportunity to explore this connection.

MATERIAL AND METHODS

The case material used in this study was derived from a large epidemiological survey which was conducted in Iceland on the lifetime prevalence of mental disorders, utilising the Diagnostic and Statistical Manual of Mental Disorders version III (DSM-III) (1) / Diagnostic Interview Schedule (DIS) (26) in Icelandic translation (31), as the study instrument. From an epidemiological point of view, the DIS is a particularly interesting survey instrument because it is a fully structured interview which may be administered by non-clinically trained interviewers after participation in a 40-hour training session. Both authors had received training in the use of the DIS and in the training of lay interviewers at the University of Washington Medical School in St. Louis.

The interview schedule takes a relatively short time to carry out (60–90 min), and it covers 43 of the most common diagnoses in the DSM-III (25). The reliability of the DIS diagnoses compared with that of the DSM-III has been found to be good (27). The DIS was used recently with good results to study pain problems among subjects with systemic lupus erythematosus (20).

The study cohort was randomly chosen among every other person born in the year 1931. Because all the participants were of the same age (55–57 years old) at the time of the survey, no age-related differences should be encountered in the results. The participation rate in this epidemiological study was over 79%, or 862 completed interviews. The gender distribution was 441 men and 421 women. For a more detailed description of the epidemiologic study see Stef nsson et al. (32) and L ndal & Stef nsson (19).

Pain

In the somatisation part of the DSM-III/DIS (18), the subjects were asked about pain in the following areas: Head, chest, abdomen, back, extremities, joints, mouth, genitalia, and other areas.

If a positive answer was given on the DSM-III/DIS as to pain in any of the above areas, additional standardised questions were put to the subject in order to clarify the seriousness of the pain. These included a question on whether a physician had been consulted, and if so, whether he had declared the pain to derive from a specific physical cause or from a non-specific, non-physical cause*.

Smoking

The DSM-III/DIS includes a section on tobacco use. If our survey participants admitted to having smoked more than 1/2 a packet of cigarettes a day, they were classified as having smoked. However, if the subject had never smoked the above amount, they were classified as not having smoked.

We summarized the participants' medical reasons for the back pain which had been given to them when they consulted a physician. In order to quantify and simplify these diverse medical diagnoses given to the subjects by numerous physicians, a general list of causes of back pain was constructed, a list which was felt would encompass all medical explanations given to subjects. The list consisted of the

following problem categories into which all the subjects' answers were re-categorized:

1. Inflammatory problems (e.g. rheumatic disease and infections)
2. Structural problems (e.g. scoliosis)
3. Post-trauma problems (e.g. spinal fracture/dislocation)
4. Congenital problems (e.g. spondylolysis/olisthesis)
5. Intervertebral disc problems (e.g. disc protrusion/pro-lapse)
6. Degenerative problems (e.g. arthrosis of facet joints)
7. Muscular pain problems (e.g. local pain due to inflamed muscle)
8. Sciatica problems (e.g. referred pain due to pinching of sciatic nerve) (e.g. disc prolapse or osteophyte)
9. Referred pain problems (e.g. sciatica)
10. Other and unspecified problems

A blind estimate was made by an independent Ph.D. neurologist who was instructed to place all the old diagnoses into one of the diagnostic problem categories mentioned above. After the assigning of subjects into the categories was completed, the number of smokers in each of the 10 new categories was compared with the number of non-smokers in that same category. This was done to determine whether there was a majority of smokers or non-smokers in one or more of the 10 categories. Each subject was only counted once. The data of both those that had smoked and those that had not were analysed.

Statistics

The methods used for statistical comparisons were repeated chi-square analysis (2 X 2) and Fisher's Exact Test (12). These statistical methods were used throughout the study. In order to diminish the likelihood of error due to repeated measurements, the significance level was set at 0.01 in order to be included in the Tables.

RESULTS

Pain

A gender comparison was carried out within each pain category in Table I, but no significant differences were found. An overall gender difference in the number of pain problems among the smokers was, however, noted in Table I. Although not shown in the Table, a higher number of subjects without pain problems was found among the women ($n=9$) compared with the men ($p < 0.0001$).

In Table I the number of subjects is shown who had either smoked or not smoked, and had experienced pain in one or more places in their lifetime. The only significant difference was found in the category of BP. A higher proportion of subjects with BP was found among the smokers ($p < 0.01$) both when physical reasons were apparent and when they were not. No other differences were found between the groups.

* As this project was not a specific pain survey, the definition and description of the pain was limited to the above-stated wording.

Table 1. *Smoking and pain. Differences in pain problems between smokers and non-smokers*
The percentages shown, are within-category proportions

Type of pain ¹	Previous and current smokers (n=478)		Non-smokers (n=384)		p
	Specific physical reason for pain (%)	No specific reason for pain (%)	Specific physical reason for pain (%)	No specific reason for pain (%)	
Abdominal or stomach pain	36	9	17	4	ns
Back pain	54 ²	11 ²	26 ²	6 ²	< 0.01
Pain in joints	40	9	24	4	ns
Pain in arms or legs	36	8	24	4	ns
Chest pains	23	5	9	3	ns
Headaches	28	9	17	5	ns
Painful menstrual periods	5	8	6	4	ns
Pain when urinating	35	3	1	23	ns
Burning pain (mouth/genitals)	2	2	1	2	ns
Pain anywhere else	16	2	7	0	ns

1 = Markings may be made in more than one category by each subject.

2 = Sign.diff. between both scoring categories.

Smoking

Of the 862 participants in the survey, 478 had smoked at least half a packet of cigarettes daily at some time (Table I). The proportion of men in the survey that had smoked this amount was 59.6 % (n=285) and of women it was 40.4% (n=193).

The gender distribution of smokers with BP is shown in Table II. In an overall comparison between the genders on smoking behaviour, men were found to have smoked more often ($p < 0.0001$). Women, however, dominated the group of smokers who had suffered from BP either in the past or in the present ($p < 0.0001$).

Of the smokers who had previously been or currently were bothered by BP, women constituted a larger proportion of those still smoking. Women had not only smoked more, but they had more often been given a "specific physical reason" for their pain problems by a physician ($p < 0.0001$).

The results from our re-classification of specific physical findings as expressed by the subjects' physicians are shown in Table III. The Table shows the following: Within the smokers' group, i.e. those who had smoked during the previous 12 months, men were found to have a higher frequency of intervertebral disc problems than did women ($p < 0.009$). The same difference was not found among those who had not smoked for more than 1 year.

Because of the nature of the survey that was used as the basis for the present study, i.e. the estimation of specific psychiatric disorders, we examined whether there was an association between depression and BP (21) but found none.

DISCUSSION

In the present study we found that men had more commonly smoked in the past than women, a finding in line with known smoking behaviour in Iceland (30). We did not, however, find a gender difference in specific pain problems when current smokers were compared with each other, except in the case of subjects who had no pain at all. In this case, women were more frequently painless.

We also found a clear difference between the smokers and the non-smokers with reference to the experience of BP as shown in Table I. This difference was apparent in the cases where a physical reason was known for the pain or was not known. In all cases men were in the majority.

These findings from a general population sample lend further support to the bulk of evidence that has accumulated in recent studies that BP among smokers is more common and that the physico-medical explanation put forward by Ernst (11) may be plausible. No other differences were found in our study between the

Table II. The gender distribution of smoking habits of those with back pain

	Men (n = 192)		Women (n = 120)		<i>p</i> < 0.0001
	Specific physical reason for pain	No specific reason for pain	Specific physical reason for pain	No specific reason for pain	
Number of subjects with back pain	152	40	107	13	
Proportion which has smoked:	%	%	%	%	
-within last 2 weeks	28*	38	54*	54	<i>p</i> < 0.0001
-within last month	1	3	0	0	
-within last 6 months	2	0	2	16	
-within last year	2	0	4	0	
-more than 1 year ago	51*	47	25*	30	<i>p</i> < 0.0001
-Did not answer	$\frac{16}{100}$	$\frac{12}{100}$	$\frac{15}{100}$	$\frac{0}{100}$	

* = Statistical differences were found between the genders regarding specific reasons for their pain.

smokers and the non-smokers on the prevalence of pain problems.

We also noted that a larger proportion of women with back pain were currently smoking at the time of the survey, although the men had back pain more frequently as shown in Table II. It was further seen that the frequency of men's pain problems did not change although we grouped and compared the proportions of subjects who had quit smoking with those who had persisted in smoking. Men had a physical reason for their pain more often than women. We are not aware of the length of time the subjects in the present study have smoked.

In the structured interview data which were used in this study, the wording of the questions on smoking is somewhat limited, referring to the amount of tobacco used daily, apart from whether it was more or less than half a packet a day. In addition, no specific question is asked on when exactly people quit smoking. When re-classified physical findings have been classified into comparable categories we find that smoking men have a greater likelihood of experiencing "intervertebral disc problems" than women (Table III). We did not find any other significant difference between the smokers' group as a whole or in part, and that of the non-smokers.

We are not able to surmise whether the difference in the back pain problems came before or after the subject started smoking. Deyo & Bass in their survey (8) did, however, find that smoking did precede the BP.

As has been shown in this paper, our findings of

intervertebral disc problems being more common among smoking men add to the existing knowledge of the connection between smoking and BP. The nature of our investigation, i.e. cross-sectional, does, however, pose certain limitations on our findings in terms of conclusiveness, in comparison with a longitudinal study. However, because of the method used, we encourage future investigators to direct their research into a longitudinal investigation of the risk of smoking and intervertebral disc problems as we ourselves intend to do.

As almost nothing is known about the smoking habits of different occupational groups in the Icelandic general population, we are unable to assess whether those who carry out work that is known to be a risk factor for BP are the ones who smoke and suffer from BP.

It is quite clear that a specific back pain study is needed where a thorough pain questionnaire, apart from one about smoking, would be put to a population sample where the largest occupational groups would be represented. Such a survey would show an even better picture of the proposed connection between pain (and BP) and smoking.

Should we then recommend back-pain sufferers to quit smoking? We could at least draw smokers' attention to a common medical opinion that smoking may be a risk factor for back pain (9,10,7). In addition, we could mention that a study by Hazard et al. (16) has revealed that those who smoked less had a higher rate of returning to work after participating in a back-pain programme.

Table III. Cause of back pain in smokers and ex-smokers

Reported medical cause *	Smokers**		p	Ex-smokers***		p
	Men (n=50)	Women (n=64)		Men (n=110)	Women (n=50)	
Inflammatory problems	2%	—	ns	2%	—	ns
Structural problems	2%	10.9%	ns	7.2%	8%	ns
Post-trauma problems	4.0	10.9%	ns	10%	4%	ns
Congenital problems	—	1.5%	ns	0.9%	2%	ns
Intervertebral disc problems	52%	26.5%	0.009	34.5%	26%	ns
Degenerative problems	12%	25%	ns	5.4%	8%	ns
Muscular pain problems	16%	10.9%	ns	21%	28%	ns
Sciatica problems	4%	3.1%	ns	6.3%	12%	ns
Referred pain problems	—	3.1%	ns	2.7%	4%	ns
Other and unspecified problems	8%	7.8%	ns	10%	8%	ns
	100%	100%	100%	100%		

* The diagnosis or explanation given to the subject by his/her physician as re-classified blindly by an independent specialist into the ten listed categories.

** Smoked 1/2 pkg./day within the last year.

*** Smoked 1/2 pkg./day more than 1 year ago.

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