Smoking and leanness: evidence for change in Finland

Bernard Marti, Jaakko Tuomilehto, Heikki J Korhonen, Leena Kartovaara, Erkki Vartiainen, Pirjo Pietinen, Pekka Puska

Abstract

Many studies have shown smokers to weigh less than non-smokers, which is plausible given the metabolic effects of cigarette smoke. The interrelation between smoking and relative body weight and its change over time were analysed by using data from Finnish population based surveys from 1982 and 1987. Among both men and women the inverse association between smoking and body mass index was clearly weakened between 1982 and 1987. In 1987 among men aged 25-44 smoking was positively related to body mass index. Moreover, the relation between smoking and weight to hip ratio was positive in both sexes at all ages. Years of smoking was the best predictor of relative weight. A cluster of unfavourable health habits, including high consumption of alcohol and saturated fats, especially emerged among younger smokers. This may have been due to different selection of smokers in Finland, where smoking increasingly seems to be a form of deviant or risk taking behaviour.

Introduction

Numerous epidemiological studies have compared the body weights of smokers and non-smokers, and nearly all have found that smokers as a group weigh less than people who have never smoked. Among men the inverse association between smoking and body weight is strongest in older smokers and weakest in younger smokers, which may be due to the duration of smoking. For example, metabolic studies have shown that smokers have an increased resting energy expenditure. Behavioural, environmental, and cognitive factors, however, are also active determinants of diet, exercise, and body weight. Indeed, smoking has shown a U shaped relation with relative weight in several studies, smokers of 5-20 cigarettes a day being the leanest.

Though paradoxical given the metabolic effects of smoking, possibly heavier smokers may weigh more because they have other unhealthy habits such as heavy drinking and little exercise. This paper examines the association between smoking and body mass index among the Finnish population in 1982 and 1987. The study used population based data collected as part of the World Health Organisation’s multinational project of monitoring trends and determinants in cardiovascular diseases (MONICA).

Subjects and methods

In 1982 and 1987 cross sectional surveys of risk factors were carried out in four areas in Finland. Independent random samples were drawn from these four populations covering the age range 25-64 years. Response rates in the surveys were 80-94%. This analysis is based on data from 4508 men and 4648 women in 1982 and 2913 men and 3212 women in 1987. The surveys included a self administered questionnaire checked by an interviewer and physical measurements. Weight, height, and girth of waist and hips were measured in light clothing by trained personnel. The body mass index (weight (kg) divided by height (m) squared) was used as a measure of relative body weight.

Information on smoking was obtained by seven standardised questions in the questionnaire. Those subjects who reported that they had smoked regularly for at least a year and at least once a day on average


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Dr Med J 1989;298:1287-90
during the past month were classified as current smokers. All others were classified as current non-smokers. The participants reported the number of years of regular smoking and current smokers the number of cigarettes, pipefuls, or cigars smoked daily. In 1987 only 56 (1·9%) of the men and 3 (0·1%) of the women reported smoking smoking pipe or cigars, and these forms of smoking accounted for less than 3% of the overall number of episodes of daily smoking in men and practically none in women.

Alcohol consumption was assessed by questions on the amount of beer, mild alcoholic beverages, strong alcoholic beverages, and wine consumed in the previous seven days. Alcohol consumption in g/week was estimated by applying the average alcoholic content and sizes of bottles or portions in Finland. An overall index of saturated fat intake was calculated on the basis of answers to questions related to consumption of milk fat and amount and type of fat spread used on bread. Leisure time physical activity was assessed on a four point scale by means of a multiple choice question characterising the amount and type of usual exercise.

Associations of smoking state with the body mass index and their change over time (period effect) were analysed for men and women separately by two way analysis of variance, age being entered as a covariate. Mean values of body mass index among subgroups stratified by different numbers of years of smoking were adjusted for age and the number of cigarettes smoked daily with general linear models, and determinants of body mass index among smokers were also analysed by multiple least squares linear regression. Standard statistical software packages were used for analyses.

**Table I** — Age adjusted means and analysis of variance of body mass index (kg/m²) among Finnish men and women stratified by smoking state and period (1982 and 1987)

<table>
<thead>
<tr>
<th></th>
<th>Body mass index</th>
<th>No studied</th>
<th>Body mass index</th>
<th>No studied</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smokers</td>
<td>26·65</td>
<td>2779</td>
<td>26·97</td>
<td>1911</td>
</tr>
<tr>
<td>Current smokers</td>
<td>25·82</td>
<td>1729</td>
<td>26·45</td>
<td>1002</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>26·32</td>
<td>4508</td>
<td>26·79</td>
<td>2913</td>
</tr>
<tr>
<td>Difference between non-smokers and smokers</td>
<td>0·83</td>
<td>0·52</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Women:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smokers</td>
<td>26·19</td>
<td>3852</td>
<td>26·51</td>
<td>2691</td>
</tr>
<tr>
<td>Current smokers</td>
<td>24·43</td>
<td>796</td>
<td>25·09</td>
<td>521</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25·88</td>
<td>4648</td>
<td>26·27</td>
<td>3212</td>
</tr>
<tr>
<td>Difference between non-smokers and smokers</td>
<td>1·76</td>
<td>1·42</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Main effects:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| period (subjects heavier in 1987 than in 1982), men p<0·001, women p<0·001; smoking state (non-smokers heavier than smokers), men p<0·001, women <0·001. Two-way interaction: period by smoking state (five year increase in body mass index greater in smokers than non-smokers), men p=0·036, women p=0·118.

**Table II** — Linear correlation coefficients of smoking with body mass index (kg/m²) among Finnish men and women aged 25-64 in 1982 and 1987 and linear correlation coefficients of smoking with waist to hip girth ratio in subjects of same age ranges in 1987

<table>
<thead>
<tr>
<th></th>
<th>Age 25-44</th>
<th>Age 45-64</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><em><em>Smoking</em> with body mass index</em>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0·03 (2300)</td>
<td>-0·13 (2208)</td>
<td>-0·06 (4508)</td>
</tr>
<tr>
<td>Women</td>
<td>-0·03 (2227)</td>
<td>-0·12 (2421)</td>
<td>-0·15 (4648)</td>
</tr>
<tr>
<td><em><em>Smoking</em> with waist to hip girth ratio</em>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0·11 (1364)</td>
<td>0·04 (1549)</td>
<td>0·05 (2913)</td>
</tr>
<tr>
<td>Women</td>
<td>0·08 (1528)</td>
<td>0·04 (1684)</td>
<td>0·03 (3122)</td>
</tr>
</tbody>
</table>

*Seven point scale: never smoked=1; ex-smoker for 6 to 12 months=2; ex-smoker for >6 months=3; irregular smoker=4; current smoker of 1-14 cigarettes a day=5; current smoker of 15-24 cigarettes a day=6; current smoker of ≥25 cigarettes a day=7.

**Table III** — Mean values of body mass index (kg/m²) adjusted for age and number of cigarettes smoked daily stratified by duration of smoking history among 990 male current smokers in 1987

<table>
<thead>
<tr>
<th>Years of smoking</th>
<th>Body mass index (SE)</th>
<th>1-10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>≥41</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=200)</td>
<td></td>
<td>(n=372)</td>
<td>(n=253)</td>
<td>(n=126)</td>
<td>(n=39)</td>
</tr>
<tr>
<td></td>
<td>26·95</td>
<td>26·90</td>
<td>26·19</td>
<td>25·63</td>
<td>24·06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0·30)</td>
<td>(0·22)</td>
<td>(0·26)</td>
<td>(0·37)</td>
<td>(0·69)</td>
<td></td>
</tr>
</tbody>
</table>

*Remaining 12 male current smokers in 1987 excluded from analysis because of lack of data.

**Results**

Table I presents the mean values of body mass index in men and women in 1982 and 1987 stratified by smoking state. Overall there was a significant increase in weight in both sexes from 1982 to 1987. The increase among men was significantly greater in smokers than non-smokers (p=0·036 for interaction), and a similar trend was observed among women.

Age emerged as an important modifying factor of the association between smoking and weight (table II); in both sexes the inverse relation tended to be stronger in older (age 45-64) than younger subjects (25-44). The correlations were of low order, indicating that smoking was not a main determinant of relative weight. From 1982 to 1987, however, all correlation coefficients showed a remarkably consistent shift (by 0·03 to 0·07) in the positive direction. Thus in 1987 a significant positive association between smoking and weight was observed in all younger men, and in the older men the inverse association substantially decreased from 1982 to 1987. In addition, in 1987 both younger men and women showed a positive association between smoking and the waist to hip girth ratio.

To elucidate the reasons for the apparent reduction in weight difference between smokers and non-smokers between the two survey years determinants of body weight among current smokers were first analysed cross sectionally. In the 1987 data age was a strong predictor of body weight among the younger smokers, but among the older smokers duration of smoking was the strongest. The number of cigarettes smoked a day was a significant positive predictor of body weight in younger but not older men (data not shown). When the analysis was repeated for the 1982 data the findings were practically identical. This showed that among the smokers smoking related predictors of body weight had not changed.

To estimate the importance of years of smoking as a predictor of body weight in men mean values of body mass index adjusted for age and number of cigarettes smoked daily were computed for men with histories of 1-10, 11-20, 21-30, 31-40, and ≥41 years of smoking (table III). There was a consistent inverse gradient between years of smoking and relative weight that was especially pronounced after more than 20 years of smoking.

Among men smokers drank more alcohol, ate more saturated fats, exercised less, were less well educated, and had higher resting heart rates than non-smokers.  

TABLE IV—Mean values (SD in parentheses) of selected characteristics of male current non-smokers and smokers in 1982 and 1987

<table>
<thead>
<tr>
<th></th>
<th>1982</th>
<th>1987</th>
<th>All</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-smokers</td>
<td>Smokers</td>
<td>All</td>
<td>Non-smokers</td>
</tr>
<tr>
<td></td>
<td>(n=2779; 61.6%)</td>
<td>(n=1729; 38.4%)</td>
<td></td>
<td>(n=4508; 100%)</td>
</tr>
<tr>
<td>Alcohol consumption* (g/week)</td>
<td>46.0 (76.0)</td>
<td>95.3 (41.5)</td>
<td>65.3 (109.2)</td>
<td>45.1 (71.1)</td>
</tr>
<tr>
<td>Saturated fat intake (g/day)</td>
<td>28.2 (21.3)</td>
<td>32.8 (23.1)</td>
<td>30.0 (22.2)</td>
<td>24.0 (19.8)</td>
</tr>
<tr>
<td>Leisure time exercise</td>
<td>2.0 (0.7)</td>
<td>1.75 (0.70)</td>
<td>1.91 (0.75)</td>
<td>2.00 (0.74)</td>
</tr>
<tr>
<td>Years of education</td>
<td>9.1 (3.4)</td>
<td>8.8 (3.2)</td>
<td>9.0 (3.6)</td>
<td>9.1 (3.8)</td>
</tr>
<tr>
<td>Resting heart rate (beats/min)</td>
<td>69.0 (12.5)</td>
<td>74.8 (12.9)</td>
<td>71.2 (12.9)</td>
<td>70.0 (12.4)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>45.1 (11.0)</td>
<td>42.9 (11.2)</td>
<td>44.3 (11.1)</td>
<td>46.1 (11.3)</td>
</tr>
<tr>
<td>Cigarettes smoked daily</td>
<td>18.2 (9.3)</td>
<td>18.2 (9.3)</td>
<td></td>
<td>18.2 (9.3)</td>
</tr>
</tbody>
</table>

*Self reported alcohol consumption during week preceding surveys.
†Saturated fat from milk and fat used on bread only (see text for results of analysis of variance).
‡Four point scale from sedentary to training for competitive endurance sports.

Discussion

Years of smoking have been shown to be the main determinant of lung cancer. Recent years of smoking has been recognised as the most informative measure of smoking for the risk of cardiovascular disease. It is also a predictor of body weight, and our cross sectional data accord with other observations of an inverse association between the duration of smoking and relative weight for men. Metabolic studies have shown an increased resting energy expenditure in smokers, so it is not surprising that the cumulative negative effect of smoking on body weight should be most clearly seen after several years of smoking. An increased metabolic rate among smokers might also explain why smokers weigh less than non-smokers despite their sometimes higher energy intake and often lower levels of leisure activity. On the other hand, the daily amount of smoking was a positive rather than negative predictor of body weight in younger smokers. Similar findings have been reported from The Netherlands.

Our main finding was that the usually observed inverse association of smoking with body weight disappeared in Finnish men and became substantially attenuated in Finnish women during 1982-7. More-
index, which is also modified by differences in body build and musculature. 1 In general our results accord with observations from the United States of a clustering of negative health habits among smokers, which may have become more pronounced in recent years. 2

We can only speculate why the characteristics of smokers in Finland seem to be changing. In the past smoking was considered to be a “normal” habit; but with the Finnish antismoking legislation from 1977, increased antismoking education, and changing public attitudes smoking is being regarded more as a deviant behaviour. Thus today smokers may be personalities more prone to risk taking and unhealthy behaviours than earlier. It may be hypothesised that the hard core of current smokers, who hitherto have resisted anti-smoking campaigns, consist of an increasing selection of people with unfavourable health behaviour. In another Finnish study 3 persistence in smoking was associated with greater use of alcohol and coffee, possibly due to a common pathophysiology of dependence. 4 On the other hand, the average number of cigarettes smoked daily by current smokers did not increase from 1982 to 1987 as one would expect for the hypothesis of an increasing cluster of negative health habits.

In conclusion our population based data from large samples of middle aged Finnish men and women suggest that the metabolic effects of smoking are apparently increasingly overridden by the present behavioural characteristics of smokers such as high alcohol and saturated fat consumption and little exercise. The earlier generally accepted notion that smokers weigh less than non-smokers 5 may thus soon turn out to be anachronistic. It also seems plain that antismoking health education aimed at young and middle aged men should place more emphasis on correcting an unhealthy lifestyle as a whole.

BM was supported by grant No 3.763.0-87 from the Swiss National Science Foundation.

(Accepted 8 March 1989)

Intralesional tumour necrosis factor combined with interferon gamma in metastatic melanoma

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Recombinant tumour necrosis factor α and interferon gamma are cytokines that show synergistic antitumour activity in vitro against clonogenic human tumour cells. 1 Remission rates of up to 40% after direct injection of recombinant tumour necrosis factor α into the tumour have been reported. 2 We looked at the therapeutic potential of these two cytokines used together in seven patients with advanced metastatic malignant melanoma.

Materials and methods and results

The study was approved by the hospital ethical committee. Three women and four men with a median age of 44 years (range 28 to 57) took part. All patients had progressive disease in more than two organ sites, which was distributed as follows: skin (seven patients), lymph nodes (three), lung (three), bone (two), and brain (one). They had all previously been treated with chemotherapy, with a median of five drugs (range four to 11), and three had also received interferon alfa. Cerebral and cutaneous metastases were common. All patients had previously responded to chemotherapy with the DJV3 combination (vindezsine, dacarbazine, carboplatin, vinblastine, and vincristine), and another patient had had a prolonged remission with interferon alfa, as already reported. 3

The planned treatment regimen was recombinant interferon alfa 100 μg/m² body surface area intramuscularly once weekly followed by weekly injection of recombinant tumour necrosis factor α once weekly into the lesion at an initial dose of 5 μg/m² and increasing to a maximum of 150 μg/m² if tolerance permitted. Selected subcutaneous lesions were injected, repeatedly when possible, except in one patient who lacked a suitable lesion and was injected subcutaneously.

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Br Med J 1989;299;1290-1

BMJ first published as 10.1136/bmj.298.6683.1287 on 13 May 1989. Downloaded from http://www.bmj.com on 23 July 2021 by guest. Protected by copyright.