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The Relationship between Body Weight and Patterns of Smoking in Women and Men

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Background. In the scientific literature, studies of the relationship between cigarette smoking and body weight yield conflicting results. Weight-lowering effects in women and men have been associated with smoking, however, no effects on weight have been proven. The purpose of this study was to examine the gender-related association between cigarette smoking and relative weight in a rural population in Styria, Austria.

Methods. A database from a health survey conducted between 1989 and 1993 in 79 selected rural communities of Styria was used for these analyses. The sample consisted of 27 344 participants, 16 185 women and 11 159 men, aged ≥15 years. We controlled for possible confounding factors such as age, years of education, alcohol consumption, regular physical activity, and chronic diseases.

Results. For women and men, in comparison to non- and ex-smokers, smoking is significantly correlated with lower body mass index (BMI). In contrast, heavy smoking and smoking cessation are significantly associated with higher relative weight.

Conclusions. We found significant results confirming an association between cigarette smoking and lower BMI in women and men, whereas heavy smoking as well as smoking cessation were significantly correlated with higher relative weight. Health intervention programmes to quit smoking should take into account the underlying perceived benefits of smoking with regard to weight, especially its gender specificity.

Keywords: smoking, body mass index, gender, health survey, Styria

Research exploring the relationship between cigarette smoking and body weight has yielded conflicting results. In some studies smoking has been associated with weight-lowering effects in women and men while in others such a relationship has not been found.[1–7] Thus, this association is incompletely understood.

Perceived benefits of smoking may be of greater importance to females than to males. Smokers tend to weigh less than non-smokers and people who quit smoking tend to gain weight.[8–13] Some studies indicate that women are more likely to use smoking as a means of weight control and that women's lower cessation rates may be related to their concerns about likely weight gain.[14] Female smokers attach special importance to the fact that smokers tend to weigh less than non-smokers and gain weight after quitting.[15]

The purpose of this study was to examine the gender-related association between cigarette smoking and relative weight in a rural population in Styria (Austria). In this analysis, we examined the relationship between cigarette smoking behaviour and body mass index (BMI) controlling for age, years of education and other confounding variables such as alcohol consumption, regular physical activity and chronic diseases.

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METHODS

Our analysis is based on data drawn from a cross-sectional health survey conducted in 79 rural communities of Styria between 1989 and 1993. A random sample of 182 761 non-institutionalized residents aged ≥15 years was selected from the population registry. In all, 27 344 participants, 16 185 women and 11 159 men, comprising a 15% sample of the 79 communities, were interviewed. The overall response rate was 74.8% which is considered satisfactory.[16] Following administration of a questionnaire, sociodemographic data, health and risk behaviour, health complaints, chronic diseases and the utilization of preventive and curative services were surveyed.

We statistically analysed the data-set using the GLM procedure of SAS/PC.[17] In order to adjust for confounding variables, we used linear regression analysis

TABLE 1 *Sociodemographic characteristics of the sample*

Mean (SD)	Women (N = 16 185)			*P*-value[a]	Men (N = 11 159)			*P*-value
	Non-smoker (N = 12 035)	Ex-smoker (N = 1229)	Smoker (N = 2921)		Non-smoker (N = 5251)	Ex-smoker (N = 2411)	Smoker (N = 3497)	
Age in years	48.5 (18.4)	44.0 (15.3)	37.4 (13.5)	< 0.0001	43.0 (18.3)	56.0 (15.3)	41.6 (15.9)	< 0.0001
Education in years	10.3 (1.6)	10.7 (1.7)	10.6 (1.4)	< 0.0001	11.0 (1.8)	10.7 (1.8)	10.8 (1.5)	< 0.0001
Body mass index[b]	24.7 (4.2)	24.6 (4.1)	23.5 (3.9)	< 0.0001	25.0 (3.4)	26.5 (3.5)	25.2 (3.3)	< 0.0001
Cigarettes per day		14.6 (10.2)	14.4 (8.8)	0.56		25.0 (15.0)	19.6 (10.8)	< 0.0001

[a] ANOVA F-test assessing effect of the smoking status.
[b] Body mass index = weight/height^2 (kg/m^2).

TABLE 2 *Linear regression of the body mass index*

Variables	Women (N = 16 185)		Men (N = 11 159)	
	Regression coefficient[a]	*P*-value	Regression coefficient	*P*-value
Smoking	–0.311	< 0.0001	–0.326	< 0.0001
Alcohol consumption	0.031	0.69	0.272	< 0.0001
Regular physical activity	–0.815	< 0.0001	–0.671	< 0.0001
Chronic diseases	0.305	< 0.0001	0.125	0.056

[a] Adjusted for age and years of education.

defining BMI as the dependent variable. Regression coefficients are accompanied by *P*-values from Wald χ^2 statistics.

Participants reported their body height and body weight. Body mass index (BMI) was computed according to the formula: BMI = weight/height^2 (kg/m^2). The assessment of smoking behaviour included current smoking status as smoker (yes/no), light smoker (<20 cigarettes per day), heavy smoker (>20 cigarettes per day),[18] and ex-smoker (yes/no). Alcohol consumption was coded dichotomously according to daily intake or not daily intake (yes/no). Regular physical activity refers to leisure-time physical exercise. Subjects were defined as physically inactive when they reported less than weekly exercise. Otherwise they were categorized into the group 'exercising regularly'. The variable chronic diseases was measured dichotomously (yes/no) when at least one chronic disease was present or not. Self-reported illnesses such as allergies, cardiovascular diseases, gastrointestinal diseases, chronic liver diseases, renal and urogenital diseases, respiratory diseases, skeletal diseases were coded dichotomously.

The socioeconomic characteristics of the sample were stratified according to smoking status and gender. Group means were compared using the ANOVA procedure of SAS. Sample means, standard deviations, and overall *P*-values are shown in Table 1.

RESULTS

The results of the linear regression analyses are summarized in Table 2. Women and men who smoke have significantly lower BMI than the group of non- and ex-smokers. Inverse association between regular physical activity and BMI is significant for both sexes. Alcohol consumption is significantly associated with higher

TABLE 3 *Relation of the smoking status to the body mass index: Results of ten linear regressions*

Variables	Women			Men		
	(N)	Regression coefficient[a]	*P*-value	(N)	Regression coefficient	*P*-value
1. Smoker versus non-smoker and ex-smoker	(16 185)	–0.311	< 0.0001	(11 159)	–0.326	< 0.0001
2. Smoker versus non-smoker	(14 956)	–0.283	0.0003	(8748)	–0.103	0.13
3. Ex-smoker versus smoker and non-smoker	(16 185)	0.369	0.0007	(11 159)	0.818	< 0.0001
4. Ex-smoker versus smoker	(4150)	0.623	< 0.0001	(5908)	1.022	< 0.0001
5. Ex-smoker versus non-smoker	(13 264)	0.312	0.005	(7662)	0.662	< 0.0001
Subgroup analyses						
6. Heavy smoker[b] versus light-smoker	(2921)	0.904	< 0.0001	(3497)	0.397	0.0015
7. Heavy smoker versus non-smoker	(12 309)	0.364	0.10	(6127)	0.085	0.46
8. Light-smoker versus non-smoker	(14 682)	–0.354	< 0.0001	(7872)	–0.178	0.0147
9. Heavy smoker versus ex-smoker	(1503)	0.104	0.69	(3287)	–0.681	< 0.0001
10. Light-smoker versus ex-smoker	(3876)	–0.702	< 0.0001	(5032)	–1.103	< 0.0001

[a] Adjusted for age, years of education, alcohol consumption, regular physical activity, chronic diseases.
[b] More than 20 cigarettes per day.

relative weight in men whereas no such relation was found in women. Having chronic diseases is significantly correlated with higher BMI only in women.

The relation between smoking status and BMI is displayed in Table 3. Male and female smokers have a significantly lower BMI when compared to the group of non- and ex-smokers. In comparison to non-smokers female smokers have a significantly lower BMI whereas this contrast does not hold true for male smokers. When comparing ex-smokers with current smokers, both sexes have a much greater BMI which is particularly noteworthy in men. Less marked but still significantly higher is the BMI of ex-smokers when contrasted with the non-smokers of both sexes.

DISCUSSION

Our study confirms the association between cigarette smoking and lower BMI in women and men. The results were significant. Heavy smoking and smoking cessation, however, were significantly correlated with higher relative weight in both sexes. One explanation could be that people who have never smoked put more effort into maintaining a lower weight than do people who were smokers previously, suggesting that people who have never smoked are more health conscious than people who once smoked. It is possible that heavy smoking forms part of a cluster of substance abuse behaviours (including over-eating and alcohol consumption), whereas in light smokers the association with a smaller BMI could be related to the known metabolic effects of nicotine. The factors underlying the association of cigarette smoking with relative body weight remain incompletely understood.[19]

Due to the desire for social acceptance and the strong social pressures on females to conform to current standards of sexual attractiveness, women in industrialized Western countries are usually more concerned with maintaining a slim figure than men.[20] Since smoking reduces appetite and satisfies oral needs, smoking may have turned into a crucial means of controlling one's weight. Thus, one might expect that females would be

more likely than males to smoke in order to maintain weight or to keep their weight low. More recent evidence has indicated large gender differences in the use of smoking for weight control.[21–24] For example, a national survey in Australia found that 32% of the women who smoked mentioned weight gain as a disadvantage of giving up smoking compared to less than 20% of the men who smoked and less than 20% of the former smokers of either sex.[25] Thus, present research indicates that more females than males view weight control as a benefit of smoking. In addition, some evidence suggests that weight gain after smoking cessation is a more important cause for relapse for females than for males,[26,27] although other findings do not support this conclusion.[28]

Research-based smoking cessation programmes should consider possible underlying gender-specific differences in the use of smoking to maintain or lower weight. In Austria, smoking has become particularly attractive for young women and smoking cessation rates are lower (9%) than in men (20%).[29] Lifestyle changes are one of the major objectives of the WHO programme 'Targets for Health for All', especially reducing the smoking rate in the population.[30] Higher cessation rates would be reached if gender-specific differences were given appropriate attention. Intervention programmes need to address women's concerns about possible weight gain in order to effectively counter 'successful' cigarette adverts suggesting slimness. In conclusion, more research is needed to explore further the relationship between women's smoking and relative weight, especially the causal association and the gender-specific implications of smoking or smoking cessation.

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