

Smoking, Low Job Control and Myocardial Infarction Risk in the Occupational Categories of Kaunas Men

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Introduction. It is a well known fact that smoking is a risk factor for myocardial infarction in the general male population, though the effect of smoking among different occupational categories and a possible correlation with low job control have not yet been determined. The objective of our study was to investigate relations between occupational position, myocardial infarction and possible risk factors, with an emphasis on the effect of smoking and low job control among Kaunas men aged 25–64 years.

Subjects and methods. We performed an epidemiological case-control study in 2001–2002. The cases (n = 203) were first non-fatal myocardial infarction (ICD-I21), controls (n = 287) were without signs of ischemic heart disease, randomly selected from the study base. We used a standardized questionnaire for both groups, which included the information on psychosocial, biological and physiological risk factors. We used a short Swedish version of the Karasek's demand-control questionnaire and the International Standard Classification of Occupations. SPSS 10.0 for Windows was used in the statistical analysis.

Results. Legislators, senior officials and managers (1st occupational category) and machine operators and assemblers (8th occupational category) were found at increased myocardial infarction risk. Smoking increased the risk of myocardial infarction 3-fold in all occupational categories. Low job control in part mediated the effect of smoking in occupational categories.

Conclusions. The preventive programs directed towards increasing job control at the workplace and smoking cessation would benefit in reducing the incidence of myocardial infarction in the working population.

Key words: smoking, myocardial infarction, case-control study, low job control, occupational categories

INTRODUCTION

Despite the fact that the epidemiological evidence linking cigarette smoking with cardiovascular disease is overwhelming, the differences in smoking habits and their role in first myocardial infarction risk among various male occupational categories have not yet been elucidated. Smoking increases the risk of myocardial infarction among men 2–3-fold (1). The relationship between smoking and myocardial infarction results from multiple mechanisms that interact to contribute to atherosclerosis, vascular injury,

thrombosis, and vascular dysfunction (2). Free radical components of cigarette smoke have been shown to cause damage in model systems (3).

Coronary heart disease morbidity rates show a marked social patterning in industrialized countries, with high rates in workers and self-employed non-professionals and low rates in professionals (4). Epidemiological studies have confirmed the fact that changes in the classical risk factors (smoking, arterial hypertension and hypercholesterolaemia / obesity) seem to partly explain the social variations in population trends in coronary heart disease (5). The differences between educational groups in prevalence of smoking increased in Denmark, and this accounted for widening of the existing social difference in the cardiovascular risk (6). In England higher

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employment grades were advantaged with regard to most risk factors (7). Overall inverse associations with educational class were found for prevalence of cigarette smokers in a northern Italian population (8). Despite this, a different picture in trends of the association of education and cardiovascular risk factors was found in a Chinese urban population, indicating that smoking decreased in the least educated men and increased in those with college level (9).

Recent studies confirmed that psychosocial work characteristics in terms of low job control contribute to social variations in myocardial infarction risk. The Whitehall II study on British civil servants showed that low job control is involved in the process that links socioeconomic status with coronary heart disease (10). The Stockholm heart epidemiology program (SHEEP) concluded that low job control might as a causal link explain about 30% of the socioeconomic differences in the risk of myocardial infarction (11). In transition countries, the only study on the psychosocial factors at work and myocardial infarction risk has been performed in Czech Republic, indicating the effect of low control in the educational gradient (12).

Our previous report revealed the occupational differences in myocardial infarction risk and the effect of low job control in various occupational categories. Low job control, measured with the aid of a short Swedish version of the Karasek's demand-control questionnaire, did not fully explain occupational differences in myocardial infarction risk among 25–64-year old Kaunas men (13). There is some evidence to show that a low job control and smoking could be connected and together enhance the risk of myocardial infarction. Employees with low job control smoke more often (14). An intervention study has demonstrated that increase in job control over 3 years was associated with a decrease in cigarette smoking (15), thus indicating that smoking and job control are connected in a psychological pathway.

We investigated the relations between occupational position, myocardial infarction, and possible risk factors, with an emphasis on the effect of smoking and low job control among Kaunas men aged 25–64 years.

SUBJECTS AND METHODS

We performed an epidemiological case-control study to assess the associations between risk factors and first myocardial infarction in Kaunas men aged 25–64 years. The study was conducted in 2001–2002 with the participation of all Kaunas hospitals. The cases were consecutive patients with first myocardial infarction

diagnosed on the basis of MONICA Protocol. Controls were randomly selected from the study base without history of ischemic heart disease and severe chest pain. Totally 203 cases and 287 controls were included into the study. They were interviewed according to a standardized questionnaire including information on demographics, socioeconomic status, behavioral and physiological risk factors. Smoking (non-smokers, current smokers, ex-smokers) was used as indicator of health behaviors. Subjects who smoked when included into the study or had stopped smoking within two years before inclusion were classified as current smokers. Body mass index (categorized according to WHO 1985 recommendations as "normal" (20.1–25.0 kg/m²), "increased" (25.1–30.0 kg/m²) and "obesity" (> 30.0 kg/m²) and blood pressure (exceeding 140/90 mmHg and/or treatment for hypertension) were used as indicators of physiological activity. Psychosocial work characteristics were based on a short Swedish version of Karasek's occupational strain questionnaire. The model measures two dimensions of the working environment: firstly, psychological job demands, and secondly, job control that describes the employee's ability to use skill or authority to address the demands. Occupation was coded using the International Standard Classification of Occupations (Geneve, 1991) and classified into 10 occupational categories. Adjustment for socioeconomic status has been performed when comparing the 1st, 2nd, 3rd occupational categories with the rest of the white-collar occupations and 7th, 8th occupational categories with the rest of blue-collar occupations.

Statistical Package for Social Sciences (SPSS) software was used for the statistical analysis. For continuous variables, medians and interquartile ranges were calculated and categorical transformation was performed. The median score for job demands was 11, for job control 14. For categorical variables, odds ratios (OR) with their 95% CI were calculated. Logistic regression was used for multivariable comparison between cases and controls. To construct the multivariable model, all variables were categorized and incorporated into a stepwise logistic regression to identify independent risk factors for myocardial infarction.

RESULTS

The exposure prevalence amongst nonfatal cases and their referents are given in Table 1. No significant differences in marital status and education among cases and controls were found. The distribution of the traditional risk factors (smoking, arterial hypertension and overweight) was more prevalent among cases than among controls. As there were small age differences among cases and controls, the calcula-

Table 1. Distribution of potential myocardial infarction risk factors among cases and controls, age-adjusted odds ratios and their 95% confidence intervals

| Risk factors | Cases (203) | | Controls (287) | | Age-adjusted | |
|--|-------------|------|----------------|------|--------------|-----------|
| | N | % | N | % | OR | 95% CI |
| Marital status | | | | | | |
| married | 178 | 87.7 | 252 | 87.8 | | |
| single | 25 | 12.3 | 35 | 12.2 | 0.99 | 0.55–1.77 |
| Education | | | | | | |
| university | 54 | 26.6 | 69 | 24.0 | | |
| secondary | 120 | 59.1 | 165 | 57.5 | 0.71 | 0.56–0.91 |
| 8 years | 29 | 14.3 | 53 | 18.5 | 0.89 | 0.66–1.21 |
| Smoking | | | | | | |
| non-smoker | 20 | 9.8 | 68 | 23.7 | | |
| current smoker | 155 | 76.4 | 170 | 59.2 | 3.10 | 1.75–5.55 |
| former smoker | 28 | 13.8 | 49 | 17.1 | 1.94 | 0.93–4.07 |
| Blood pressure | | | | | | |
| < 140/90 mmHg | 109 | 53.7 | 220 | 76.7 | | |
| ≥ 140/90 mm Hg | 94 | 46.3 | 67 | 23.3 | 2.83 | 1.89–4.26 |
| Body mass index | | | | | | |
| normal (20.1–25.0 kg/m ²) | 65 | 32.1 | 144 | 50.2 | | |
| increased (25.1–30.0 kg/m ²) | 79 | 38.9 | 78 | 27.2 | 2.24 | 1.43–3.53 |
| obesity (>30.0 kg/m ²) | 59 | 29.0 | 65 | 22.6 | 2.01 | 1.24–3.26 |
| Job control | | | | | | |
| high | 144 | 65.6 | 157 | 87.2 | | |
| low | 59 | 34.4 | 130 | 12.8 | 2.02 | 1.36–3.02 |

OR = Odds ratio, 95% CI = 95% confidence intervals.

tions of odds ratios are presented in age-adjusted form performed in the logistic regression analysis. Low job control at the workplace increased first myocardial infarction risk two fold.

Fig. 1 presents the age-adjusted odds ratios and 95% CI for first myocardial infarction among occu-

ed (1st, 8th) and non-increased (2nd, 3rd, 7th) myocardial infarction risk. No significant differences in smoking between occupational categories were found (p for homogeneity 0.52). Similar results were obtained for low control values among occupational categories, e.g., no significant differences of the effect of low control for increased and non-increased myocardial infarction risk occupational categories (p for homogeneity 0.98).

Significantly increased odds ratios for smoking in all occupational categories (model I) decreased after adjustment for low control (model II), though remaining statistically significant. Further adjustment for socioeconomic status increased the effect of smoking on myocardial infarction risk for all occupational categories (model III). After adjustment for low job control (model IV), the odds ratio estimates decreased, remaining at a statistically significant level for all occupational categories.

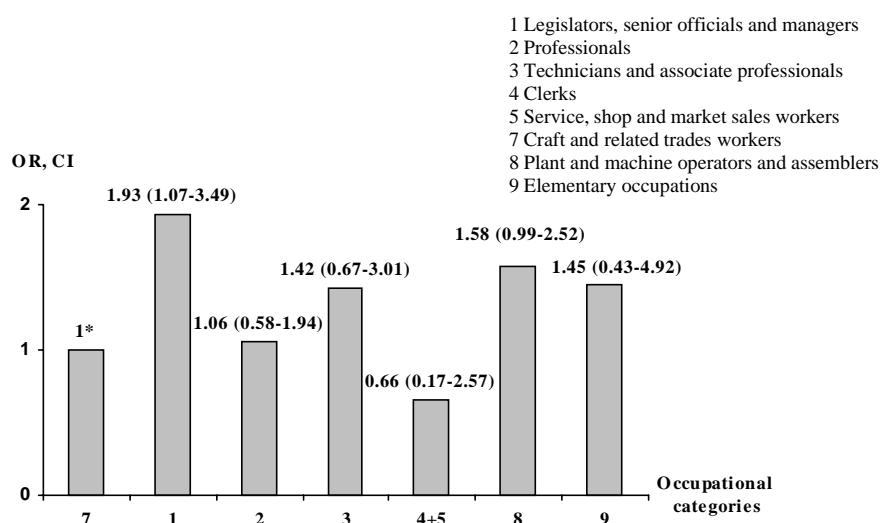


Figure. Age-adjusted odds ratios (OR) and 95% confidence intervals (CI) for the first myocardial infarction among occupational categories determined by International Standard Classification of Occupations in 25–64-year-old Kaunas men

* 7th reference group (craft and related trades workers).

Table 2. Adjusted odds ratios and 95% confidence intervals of first myocardial infarction by smoking for occupational categories

| ISCO* categories | Model I | | Model II | | Model III | | Model IV | |
|---------------------|---------|-----------|----------|-----------|-----------|-----------|----------|-----------|
| | OR | 95% CI | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| 1st ISCO category | 3.67 | 2.07–6.50 | 3.28 | 1.83–5.88 | 4.13 | 1.72–9.91 | 3.76 | 1.54–9.18 |
| 2nd ISCO category | 3.38 | 1.92–5.94 | 3.10 | 1.75–5.50 | 3.83 | 1.61–9.10 | 3.55 | 1.47–8.55 |
| 3d ISCO category | 3.41 | 1.94–6.00 | 3.08 | 1.74–5.47 | 4.03 | 1.69–9.63 | 3.77 | 1.56–9.13 |
| 7th ISCO category | 3.52 | 2.00–6.18 | 3.15 | 1.77–5.59 | 3.08 | 1.43–6.61 | 2.85 | 1.31–6.18 |
| 8th ISCO category | 3.21 | 1.82–5.67 | 2.97 | 1.67–5.28 | 3.04 | 1.41–6.54 | 2.82 | 1.30–4.60 |
| All employed men | 3.29 | 1.88–5.74 | 3.09 | 1.74–5.48 | 3.35 | 1.56–4.16 | 3.16 | 1.77–5.66 |

Model I: adjusted for age, arterial hypertension and obesity

Model II: adjusted for age, arterial hypertension, obesity, low job control

Model III: adjusted for age, arterial hypertension, obesity and socioeconomic status

Model IV: adjusted for age, arterial hypertension, obesity, socioeconomic status, low job control

* ISCO International Standard Classification of Occupations. 1991. Genzve.

1st ISCO category – legislators, senior officials and managers

2nd ISCO category – professionals

3d ISCO category – technicians and associate professionals

7th ISCO category – craft and related trades workers

8th ISCO category – plant and machine operators and assemblers

DISCUSSION

In Western societies, an inverse social gradient in myocardial infarction incidence has been demonstrated, with higher rates in lower social positions (4, 11). The results from our case-control study showed that legislators, senior officials and managers (1st occupational category) and plant and machine operators and assemblers (8th occupational category) are at a higher risk of first myocardial infarction as compared to craft and related trades workers (7th occupational category). Our findings suggest that, unlike in Western countries where the inverse social gradient in myocardial infarction risk really exists, the occupational differences in Lithuania, a transition country, are obvious too, though in the opposite direction, with the dominance of the higher social positions (1st occupational category). Elementary occupations (9th occupational category) show no increase in first myocardial infarction risk.

We tested the hypothesis that smoking is a risk factor of first myocardial infarction for all the occupational categories among Kaunas men aged 25–64 years and found that though differences in myocardial infarction risk among occupational categories do exist, smoking as an independent risk factor is not influenced by its effect modification depending on employment status. Though the findings in Western societies revealed that traditional risk factors might explain some differences among occupational categories in myocardial infarction risk (16), our study did not find differences in the effect of smoking on myocardial infarction risk among the occupatio-

nal categories of increased (1st, 8th) or non-increased risk (2nd, 3rd, 7th, 8th). The level of significance (p for homogeneity) for smoking among occupational categories was >0.05 , thus indicating no differences in smoking effect.

Studies in Western societies have concluded that the largest contribution to the socioeconomic gradient in ischemic heart disease frequency comes from low control at work, while standard ischemic heart disease risk factors contribute less (10). Our findings suggest that low job control and smoking are independent risk factors for the first myocardial infarction, as their effect for all the occupational categories is statistically significant. The level of significance (p for homogeneity) for low control among occupational categories was >0.05 , thus indicating no differences in low job control effect on the first myocardial infarction risk.

Our previously published data revealed a strong effect of a low job control on myocardial infarction risk in all the occupational categories after all adjustments (13). The results from the logistic regression analysis (Table 2) showed that after adjustment for low job control the effect of smoking decreased in all occupational categories, though remaining at a statistically significant level. These findings suggest that low control could in part mediate the association between smoking and myocardial infarction risk for all the occupational categories.

Some possible limitations of the study might include errors in myocardial infarction cases' ascertainment, coding errors, recall bias due to underestimation of smoking among cases, as the persons

with acute myocardial infarction are prone to misreport their smoking habits. To avoid the effect of such bias, persons were asked when they had given up smoking and only those who had done it two years before the inclusion into the study were categorized as ex-smokers. Only alive cases of the first myocardial infarction were included into the study, as the information of the possible myocardial infarction risk factors was obtained by a face-to-face interview. Therefore the results of the study could be generalized only to non-fatal first myocardial infarction.

CONCLUSIONS

1. Occupational differences in the risk of myocardial infarction in the population of Kaunas men are obvious.

2. Smoking is an independent myocardial infarction risk factor, and it is not modified by employment status.

3. Low job control in part mediates the association between smoking and myocardial infarction for all occupational categories of Kaunas men.

4. The preventive programs of increasing job control at the workplace and smoking cessation would have benefit in reducing the incidence of myocardial infarction in the working population.

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RŪKYMAS, MAŲA GALIMYBĖ PAĖIAM KONTROLIUOTI SAVO DARBĄ IR MIOKARDO INFARKTO RIZIKĄ ŽVAIRIOMS KAUNO VYRŲ PROFESIJŲ GRUPĖMS

S a n t r a u k a

Ávadas. RŪkymas yra nustatytas miokardo infarkto rizikos veiksnys bendrojoje vyrŲ populiacijoje. Taėiau rŪkymo poveikis űvairioms profesijŲ grupėms ir galima sűveika su maŲa galimybe paėiam kontroliuoti savo darbŲ nėra iűtirta. MűsŲ darbo tikslas buvo iűtirti ryŲŲ tarp profesinio űpimtumo, miokardo infarkto ir galimŲ rizikos veiksniŲ, atkreipiant dėmesŲ ű rŪkymo ir galimybės paėiam kontroliuoti savo darbŲ poveikŲ miokardo infarkto rizikai tarp 25–64 m. Kauno vyrŲ.

Tiriamieji ir darbo metodai. Atlikome epidemiologinŲ (atvejai ir kontrolė) tyrimŲ tarp 25–64 m. Kauno vyrŲ 2001–2002 metais. AtvejŲ grupė (N = 203) sudarė pirmŲ miokardo infarktŲ (TLK I21) patyrė vyrus, kontrolinė (N =

= 287) – atsitiktinai parinkti vyrai be iűeminės űirdies ligos poŲymio. Standartizuoto klausimyno dėka surinkome duomenis apie abiejŲ grupiŲ vyrŲ socialinius, biologinius ir fiziologinius rizikos veiksnius. Naudojomės Karaseko klausimyno trumpa űvedŲ versija ir Tarptautine ProfesijŲ Klasifikacija.

Rezultatai. ÁstatymŲ leidėjai, vyresnieji pareigŲnai ir vadovai (1-oji profesijŲ grupė), taip pat maűinŲ operatoriai ir surinkėjai (8-oji profesijŲ grupė) sudarė didesnę miokardo infarkto rizikos grupė. RŪkymas tris kartus padidino miokardo infarkto rizikŲ visoms profesijoms. Toks rizikos veiksnys, kaip maŲa galimybė paėiam kontroliuoti savo darbŲ, iű dalies turėjo űtakos rŪkymo efektui.

Išvados. Profilaktinės programos maŲinant rŪkymŲ ir suteikiant galimybė paėiam daugiau kontroliuoti savo darbŲ padėtŲ sumaŲinti darbuotojŲ sergamumŲ miokardo infarktu.

RaktaŲodŲiai: rŪkymas, miokardo infarktas, atvejai ir kontrolė, maŲa galimybė paėiam kontroliuoti savo darbŲ, profesijŲ grupės