Addictive Behaviors 39 (2014) 1145–1151

Contents lists available at ScienceDirect

Addictive Behaviors

Smoking, nicotine dependence and nicotine intake by socio-economic status and marital status

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HIGHLIGHTS

- Smokers with a low socio-economic status had a greater degree of nicotine dependence
- Lower levels of education and occupation associated with higher levels of cotinine
- Lower socio-economic status was associated with daily smoking

ARTICLE INFO

Available online 13 March 2014

Keywords:
Addiction
Cessation
Cotinine
Nicotine
Smoking
Socio-economic status

ABSTRACT

Introduction: Low socio-economic status (SES) is strongly related to smoking, but studies examining the association of SES with nicotine dependence (ND) are scarce. The aim of this study was to examine the associations of SES and marital status with smoking, multiple measures of ND, and cotinine as a nicotine intake biomarker.
Methods: The sample comprised 1746 ever smokers, sampled from the National FINRISK 2007 Study, who had completed a tobacco specific questionnaire in addition to the standard clinical examination. The Fagerström Test for Nicotine Dependence (FTND), the Heaviness of Smoking Index (HSI), the Nicotine Dependence Syndrome Scale (NDSS), and the Hooked On Nicotine Checklist (HONC) were assessed, while plasma cotinine was measured as a biomarker of nicotine exposure in daily smokers. Univariate and multivariate associations were assessed by linear regression and multinomial logistic regression.
Results: In multivariate models, lower education was associated with higher FTND and HSI, income with HSI, and occupation with HSI (men only), FTND, HONC and NDSS scores. Lower education was related to higher cotinine levels among daily smokers, although the association diminished slightly after adjusting for daily smoking amount. Living without a spouse was associated with daily smoking and higher ND.
Conclusion: In this cross-sectional study low SES was linked with higher ND among current smokers, while low SES was associated with higher cotinine levels among daily smokers. Living alone was linked with higher ND. Longitudinal studies are warranted to further explore these associations. As lower SES smokers are more addicted they may need more targeted cessation services to succeed in quitting smoking.

1. Introduction

Over the past decades, smoking prevalence in Finland is declining among men on the population level and in most socio-economic groups. Among women, however, the prevalence has plateaued, with somewhat divergent trends between socio-economic groups (Helldán, Helakorpi, Virtanen, & Uutela, 2013), possibly attributable to differences

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http://dx.doi.org/10.1016/j.addbeh.2014.03.005
0306-4603/

in initiation age, number of cigarettes per day (CPD) and nicotine dependence (ND), all of which could lead to some groups having a lower cessation rate and longer duration of smoking (Hiscock, Bauld, Amos, Fidler, & Munafo, 2012). Differences by marital status have also been observed. Married or co-habiting persons tend to smoke less frequently (Goodwin, Pagura, Spiwak, Lemeshow, & Sareen, 2011).

People smoking similar numbers of cigarettes may have different nicotine intake levels, depending on smoking style (depth and volume of inhalation). Cotinine as a primary metabolite of nicotine is used as a biomarker of smoking and nicotine intake (Benowitz, Hukkanen, & Jacob, 2009). Benowitz, Dains, Dempsey, Wilson, and Jacob (2011) found that weakly dependent smokers demonstrated a linear rise in cotinine with increasing consumption of cigarettes, whereas highly dependent smokers had a flat relationship, indicating that the latter smoke cigarettes more intensively in order to maximize nicotine intake (Benowitz et al., 2011).

Various measures of nicotine dependence exist. The Fagerström Test for Nicotine Dependence (FTND) combines an index of cigarette consumption with the difficulty in tolerating reduced nicotine levels. The Heaviness of Smoking Index (HSI) is a short two item version of FTND (Heatherton, Kozlowski, Frecker, & Fagerström, 1991). The Nicotine Dependence Syndrome Scale (NDSS) measures multiple dimensions of nicotine dependence, including craving, withdrawal, and tolerance (Shiffman, Waters, & Hickcox, 2004), while the Hooked On Nicotine Checklist (HONC) assesses loss of autonomy over smoking (DiFranza et al., 2002).

The relationship of different measures of nicotine dependence scales and cotinine with socio-economic status within the same population-based sample may provide insights into the basis of socioeconomic differences in smoking behavior and nicotine dependence. This could significantly enhance understanding of the relationship of socio-economic status (SES) with nicotine dependence, and consequently improve smoking cessation strategies.

Our study aim was to investigate the cross-sectional association of SES and marital status with various measures of nicotine dependence and cotinine levels. We explored whether different indicators of socio-economic status among smokers, such as education, income, occupation, and marital status were associated with cigarettes per day, four measures of dependence, and plasma cotinine levels. The hypotheses of this study were as follows:

Hypothesis 1. Low levels of SES and living without a spouse are associated with daily smoking.

Hypothesis 2. In daily smokers low SES and living without a spouse are associated with more cigarettes smoked per day.

Hypothesis 3. Smokers with low SES and living without a spouse have a greater degree of nicotine dependence assessed by multiple measures.

Hypothesis 4. In daily smokers low SES and living without a spouse are associated with higher levels of plasma cotinine.

2. Methods

2.1. Data compilation and participants

The data were derived from the National FINRISK Study that monitors levels of chronic disease risk factors every five years in Finland (Vartiainen et al., 2010). In 2007, the survey was carried out in six regions: 1) Helsinki and Vantaa, 2) Turku and Loimaa, 3) North Savo, 4) North Karelia, 5) the Oulu region, and 6) Lapland. The data were gathered into two stages. The FINRISK data for the first part of the study were collected at the beginning of 2007: participants (n = 11,953) (all 6 regions) were invited to fill in an extensive baseline questionnaire (n = 7993, 67%) and to attend a locally organized health examination in which blood samples were taken (all regions but Lapland) (Peltonen et al., 2008).

After the baseline study, a self-administered questionnaire with detailed smoking and nicotine dependence (ND) items was given to individuals who had stated during the first part of the study that they had smoked at least 100 cigarettes during their lifetime (regions 1 to 3), or that they were current smokers (regions 4 to 5) (N = 1992). A few months later the same individuals were invited to participate in a study of dietary and obesity-related risk factors (Peltonen et al., 2008). Completed questionnaires were returned by mail, with one reminder (Broms et al., 2012). The number of participants in the smoking sub-study was 1746 (91% response rate). Plasma cotinine was analyzed for those who identified themselves as daily smokers during the main FINRISK data collection and responded to the tobacco-specific questionnaire.

2.2. Assessment of smoking and nicotine dependence

In the baseline questionnaire, the respondents were asked whether they had ever smoked. Those stating they had never smoked were categorized as never smokers. Ever smokers were defined as those who had smoked at least 100 cigarettes in their lifetime. Three questions were used to classify ever smokers as quitters, occasional smokers or daily smokers; the latter two being current smokers. Quitters reported having been either regular or occasional smokers but were not smoking currently, and had last smoked more than a month ago. Occasional smokers reported having been regular or occasional smokers, and currently smoked occasionally. Daily smokers reported regular and current daily smoking, and had smoked 'yesterday or today'. In order to create a variable for cigarettes per day (CPD) participants were asked to indicate the average number of both manufactured and self-rolled cigarettes they smoked per day, or had smoked before quitting. Manufactured and self-rolled cigarettes were totaled.

In the baseline questionnaire, the only measure of nicotine dependence was the Heaviness of Smoking Index (HSI). The HSI score is based on two items: cigarettes per day and time to first cigarette after waking up, both scored 0 to 3. These two items were totaled (range 0 to 6) (Haddock, Lando, Klesges, Talcott, & Renaud, 1999; Heatherton et al., 1991). HSI was thus available for all current smokers (daily and occasional) (n = 1609) from the baseline questionnaire.

Plasma cotinine was measured by gas chromatography from fasting plasma samples collected during the baseline clinical examination (Broms et al., 2012), but only for those who responded to the tobacco-specific questionnaire. Participants were not required to abstain from smoking before sample collection, although they were asked whether they had smoked within the last hour (Broms et al., 2012). The lower limit of quantification was set at 5 μg/L, but the cut point for active smokers was set at 10 μg/L. Analyses of cotinine were restricted to daily smokers, who have stable cotinine values due to the long half-life of cotinine. Given skewness of cotinine values, log-transformed values were used in the regression models.

The tobacco-specific questionnaire provided additional information about nicotine dependence on three scales. The Fagerström Test for Nicotine Dependence (FTND) consists of six items (Heatherton et al., 1991) focusing on the physical aspects of dependence and scored 0 to 10 (Haddock et al., 1999). The Hooked On Nicotine Checklist (HONC) is a 10-item scale (sum score 0 to 10) measuring loss of autonomy over tobacco, identifying the beginning of dependence and measuring its severity (DiFranza et al., 2002). The multidimensional Nicotine Dependence Syndrome Scale (NDSS) has 31 items and a total score computed by means of regression-based algorithms based on 14 items (sum score 0 to 56) (Shiffman et al., 2004); the NDSS subscales were not used in these analyses. Higher scores imply a greater degree of nicotine dependence in all four measures. They measure somewhat different aspects of dependence. Thus, the correlation among current smokers between FTND and HONC was 0.56, between FTND and NDSS 0.69, and between HONC and NDSS 0.57. Among daily smokers cotinine showed correlations of 0.49, 0.19, and 0.34 with FTND, HONC, and NDSS, respectively.