



Cigarette smoking in young-adult workers: a cross-sectional analysis from Abruzzo, Italy

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Abstract

Background: The "Valentino" cross-sectional study is aimed at evaluating the prevalence and pattern of cigarette smoking according to occupational group in a representative sample of workers aged 18-35 years from Abruzzo, Italy.

Methods: Randomly selected workers anonymously self-compiled a structured questionnaire containing validated items. Job type was coded according to the International Standard Classification of Occupations.

Results: The sample consisted of 3989 workers. Current smoking prevalence was 45.9%, varying across occupational groups and ranged from 37.2% among clerical support workers, up to 57.1% among craft, agricultural and fishery sector workers. After controlling for several potential confounders using logistic regression, craft, agricultural, forestry and fishery workers (adjusted odds ratio 1.65; 95% confidence intervals 1.21-2.27), and call-center operators (1.91; 1.44-2.53) were significantly more likely to be current smokers than professionals and clerical or support workers. Interestingly, when alcohol and cannabis use were included in multivariate analysis, the association between smoking and gender was no longer significant.

Conclusions: An independent association was found between specific occupational classes and tobacco smoking, suggesting occupation type should be considered in prioritizing subsets of populations towards which smoking cessation campaigns should be targeted first.

Key words: cigarette smoking, young-adult workers, occupational groups, Italy

Introduction

The detailed negative health effects of cigarette smoking have been widely reported and the prevention of smoking is among the key actions in the health agenda of most European countries [1].

Among the potential strategies for smoking prevention and cessation, those specifically targeted towards subgroups of the population have shown promising results and are recommended in order to improve prevention efficacy [2,3]. In order to collect the detailed information needed to develop tailored strategies, subgroups have been identified and analyzed according to age [2,3], gender [4], race [5], and educational level [6,7].

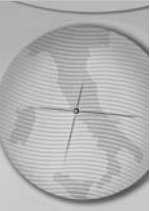
The social cost of workplace smoking in terms of increased risk of accidents, excess absenteeism and reduced productivity [8,9], together with the

renewed interest on workplace smoking cessation programmes [10,11], have stimulated studies that have investigated smoking patterns among different occupational groups [12]. Despite a recent rise in smoking prevalence among young-adults, little attention has been paid to this group of employees [13,14].

This paper presents the results from the Valentino Study, a cross-sectional survey designed to evaluate cigarette smoking prevalence and patterns according to occupational group in a representative sample of workers aged between 18-35 years from Abruzzo, Italy.

Methods

The methodology has been described in detail elsewhere [15,16]. In brief, using the Regional



Business Registry, public and private companies that were to be contacted were selected randomly, stratifying by size and core business. If a company refused to participate, the following one in the Registry was contacted. Given the high rate of refusal among companies, the main unions were contacted to support enrollment and ensure the representativeness of the sample in terms of job type distribution (estimated using Italian National Institute of Statistics - ISTAT - data) [17]. When a company accepted to participate, all employees were requested to compile a structured questionnaire consisting of 101 items related to socio-demographic characteristics, self-reported health, work stress, work organization, physical activity and pattern of tobacco consumption, food and legal and illegal drug consumption. The majority of items were derived from validated instruments including SF-12 for health status [18], CAGE for alcoholism [19], Job-Strain [20] and Effort-Reward Imbalance [21] for work stress, and EU-DAP for substance abuse [22]. A subject was classified as "current smoker" if, in the last 30 days, he/she smoked at least one cigarette per day or seven cigarettes per week. In this study, smoking is referred to cigarette smoking only.

Body Mass Index (BMI) was calculated according to international standards [23]. To reduce false or missing answers, sealed boxes were used to collect questionnaires and total anonymity was rigorously guaranteed to all workers before and after collection. The protocol was approved by the Local Ethics Committee and all questionnaires were collected between January and October 2007.

Statistics

The sample was stratified according to the Italian version of the International Standard Classification of Occupations (ISCO) [24], which identifies nine occupational groups: Managers; Professionals; Technicians and associate professionals; Clerical support workers; Service and sales workers; Craft, skilled agricultural, forestry and fishery workers; Plant and machine operators and assemblers; Elementary occupation; Armed forces. An additional category - call-center operators (ISCO code 4223) - was analyzed separately because high stress and job dissatisfaction were previously documented in these workers [25]. Work stress was evaluated using a shortened version of the Job Content Questionnaire [20,21] and categorized accordingly to Karasek model. High job strain refers to a combination of high workload and low job control whilst low job strain to the reverse combination (low workload and high

job control). Other cases were classified as intermediate job strain.

Sample size estimation

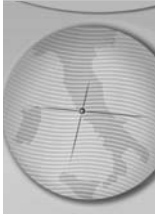
To evaluate sample size, the estimated prevalence of current cigarette smokers was set at 30% [26]. A total of 160 subjects per occupational group were thus needed to detect a significant difference of 10% in absolute smoking prevalence between groups (assumed as a potential range between the job classes with the lowest/highest and average smoking prevalence). Based upon Italian data on job distribution [17], and setting 4% as the lowest prevalence of an occupational group (with a 50% over sampling of managers), a total of 4000 subjects were needed.

Data Analysis

Initial descriptive statistics were used to analyze the distribution of cigarette smoking in the sample according to all variables investigated. Logistic regression was used to evaluate potential independent predictors of current cigarette smoking (as compared to never smoking only, and excluding former smokers).

Since no reference category could be identified for occupational groups, the occupational group with the lowest current smoking prevalence was selected as the reference category (clerical and support workers). Because professionals had a very similar smoking prevalence, and in order to have a larger comparison group, the final model grouped both professionals and clerical / support workers as a single reference category. The odds ratios were therefore referred to each job type versus professionals and clerical / support workers. Covariates were included with a forward stepwise procedure, limiting their number to less than 10 per success to limit overfitting. Standard post-estimation tests were used to assess the final model validity, performing multicollinearity and influential observation analyses (using standardized residuals, change in Pearson and deviance chi-square), and testing for potential statistical interactions between occupational groups and the other covariates. Only two border line significant interactions - between being manager and consuming cocaine and being a call-center operator and using cannabis - were observed, both strongly associated with a greater likelihood of smoking. However, the estimates were also very unstable and their inclusion did not alter the odds ratios. Therefore, they were not included in the final model.

All analyses were repeated, excluding 97 influential observations, and after multiple



imputation with bootstrap option ($m=5$) [27], for missing values (which were lower than 5% for all items, but in the final model they approached 10%). As results were very similar, only the complete regression model has been shown to avoid redundancy. Analyses were performed using STATA, version 10.1 (Stata Corp., College Station, TX, 2007) [28].

Results

Both armed forces professionals, who's number were too low to allow meaningful analyses ($n=35$), and questionnaires with an occupational category missing ($n=127$) or evidently incongruous compilation ($n=38$) were excluded from the final sample, which consisted of 3,989 young-adult

workers (54.6% males; mean age 28.3 ± 4.7 years).

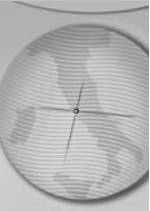
The overall prevalence of current cigarette smoking was 45.9% (49.1% in males; 42.1% in females). The use of tobacco products other than cigarettes was limited to 1.2% of the sample. As shown in Table 1, current smoking prevalence varied across occupational groups, ranging from a minimum of 37.2% among clerical support workers, up to 57.1% for craft, agricultural and fishery workers.

The results of the multivariate analysis to identify independent predictors of smoking are also reported in the Table. Adjusting for age, gender, body mass index, marital status, educational level, work stress, alcohol consumption, and cannabis or cocaine current or former use, craft, agricultural,

Table 1. Logistic regression model predicting current smoking in the sample of 3989 young workers from Abruzzo, Italy.

| Variables | % * | Current smoking (n=1829 – 45.9%) | | | p |
|--|------|----------------------------------|--------------------------|-------------------|--------|
| | | Crude OR ^A | Adjusted OR ^A | Adjusted (IC 95%) | |
| <i>Occupational categories^A</i> | | | | | |
| Clerical Support Workers (n=627) | 37.2 | 1 | 1 | -- | -- |
| Professionals (n=440) | 39.4 | 1 | 1 | -- | -- |
| Managers (n=93) | 39.6 | 1.06 | 1.32 | (0.78-2.27) | 0.3 |
| Elementary occupation (n=214) | 42.9 | 1.22 | 1.01 | (0.67-1.51) | 0.9 |
| Technicians and associate professionals (n=862) | 45.5 | 1.35 | 1.27 | (0.98-1.63) | 0.064 |
| Service and sales workers (n=733) | 48.4 | 1.52 | 1.19 | (0.93-1.52) | 0.2 |
| Call-Center operators (ISCO code 4223) (n=402) | 50.6 | 1.67 | 1.91 | (1.44-2.53) | <0.001 |
| Plant and machine operators, and assemblers (n=125) | 52.1 | 1.76 | 1.53 | (0.96-2.45) | 0.075 |
| Craft, Agricultural, Forestry, and Fishery workers (n=493) | 57.1 | 2.16 | 1.65 | (1.21-2.27) | 0.002 |
| Male gender (n=2174) | 49.1 | 1.32 | 0.86 | (0.72-1.04) | 0.12 |
| Age, 1 year increase | -- | 0.98 | 0.99 | (0.97-1.01) | 0.3 |
| <i>BMI^B</i> | | | | | |
| Normal (n=2474) | 45.5 | 1 | 1 | -- | -- |
| Underweight (n=221) | 49.3 | 1.16 | 1.25 | (0.90-1.75) | 0.2 |
| Overweight (n=1045) | 45.7 | 1.01 | 1.14 | (0.96-1.38) | 0.13 |
| Obese (n=153) | 47.4 | 1.08 | 0.94 | (0.63-1.40) | 0.7 |
| <i>Marital Status</i> | | | | | |
| Married (n=1102) | 40.0 | 1 | 1 | -- | -- |
| Separated / divorced / widowed (n=294) | 48.2 | 1.39 | 1.03 | (0.74-1.42) | 0.9 |
| Never married (n=2383) | 49.0 | 1.44 | 1.13 | (0.93-1.37) | 0.2 |
| Educational level ^C | -- | 0.79 | 0.80 | (0.69-0.91) | 0.001 |
| <i>Job-related stress (Karasek Job strain model)</i> | | | | | |
| High job strain level (n=586) | 54.1 | 1 | 1 | -- | -- |
| Intermediate level (n=2892) | 45.7 | 0.71 | 0.91 | (0.78-1.05) | 0.11 |
| Low job strain level (n=338) | 41.4 | 0.60 | 0.68 | (0.49-0.94) | 0.020 |
| Alcohol consumption vs no consumption (n=2036) | 58.6 | 2.97 | 2.39 | (2.18-2.82) | <0.001 |
| Current or former cannabis consumption (n=1244) | 71.3 | 4.98 | 5.26 | (3.93-7.03) | <0.001 |
| Current or former cocaine consumption (n=536) | 75.1 | 4.38 | 2.00 | (1.16-3.43) | 0.012 |

OR = Odds Ratio; CI = Confidence Interval. Hosmer-Lemeshow p-value for the goodness of fit = 0.49. * Percentage of current smokers according to the different variables in the table. ^A Odd ratios refer to the risk of current smoking versus never smoking according to each variable. With regard to occupational groups, the reference category is constituted by both professionals and clerical and support workers. ^B BMI categories were defined as follows: BMI<18.5 (underweight) 18.5-24.9 (normal); 25-29.9 (overweight); ≥ 30 (obese). ^C Educational level was categorized as follows: 1 (no title), 2 (elementary and intermediate degree), 3 (high school), 4 (bachelor of higher). It was treated as an ordinal variable.



forestry and fishery workers, as well as call-center operators, were more likely to be current smokers as compared to professionals and clerical / support workers (both $p < 0.01$).

Other significant predictors of current smoking were lower educational level, high job-strain, alcohol consumption, current or former use of psychoactive drugs, cannabis and cocaine.

Discussion

Previous studies have documented that differences in smoking prevalence across occupational groups are widening in the USA, and smoking is more concentrated among selected subpopulations including construction, extractive trade, forestry and fishing workers [29-31]. An independent association between smoking and occupational type was documented by Barbeau and colleagues, who observed a lower likelihood of current smoking among non-manual workers, even after controlling for age, gender, and race/ethnicity [18].

Our findings expand the existing evidence as, for the first time to our knowledge, among a sample of young workers in Italy, some specific occupational classes were significantly related with current smoking after controlling for several confounders such as educational level and job-related psychological stress.

These findings suggest that future research aimed at investigating the etiology of cigarette smoking should also take into account the independent role played by occupational status. Moreover, the observed associations may help in identifying high- or low-risk individuals and prioritizing these subsets of populations to whom smoking cessation campaigns should be targeted first. Indeed, several studies have shown the effectiveness of interventions like covering group therapy, individual counseling, self-help materials, nicotine replacement therapy, social support and other strategies. As an example of a successful alternative health promotion policy, the European campaign "Quit and Win" set up a competition in which a monetary award could be won by one of the smokers who had been able to quit for at least four weeks [32]. Importantly, these interventions proved to be more effective when targeted at specific groups of workers, e.g. hospitals staff or manufacture workers [10].

Interestingly, we observed small differences between the ranking of occupations when using the percentage of smokers or the adjusted odds ratios. In this sample, the smoking frequency of the different occupational groups were a good proxy for the intention to prioritize between the

different groups.

Concerning other smoking predictors, our findings support literature reporting a positive association between current smoking and low educational level [6,7], psychological chronic stress [33], alcohol consumption [34] and illegal substance abuse [35]. Conversely, and unexpectedly, the association between smoking and male gender - which is established in literature [12,36] - was no longer significant when alcohol use was included in any multivariate model. A similar effect - although smaller - was caused by the inclusion of cannabis and cocaine consumption in logistic models. Because all of these factors are strongly associated with both male gender (all $p < 0.001$) and smoking (Table 1), it may be hypothesized that the association between male gender and smoking may just be the result of confounding caused by alcohol and/or other psychoactive drug use. However, this finding clearly requires confirmation from other specifically designed cross-sectional studies, in which all the above variables are included in a multivariate analysis.

The study has some limitations that must be considered. Firstly, the cross-sectional design of the survey enabled us to determine only simple associations between variables rather than cause-effect relationships.

Secondly, the prevalence of current smoking of our working population was considerably higher when compared with the prevalence estimated in the general adult population (workers and non) by a recent survey of the Italian National Institute of Statistics (29.9% for the Abruzzo Region) [26]. Although a difference between working and non-working groups has been documented [26], its magnitude was surprising and it may be due, at least in part, to selection bias. However, our sample was representative of the general population of workers of similar age groups from Central Italy in terms of age, gender and marital status, and differed only in the distribution of some occupational groups (professionals and elementary occupations being over- and under-represented, respectively) [37]. Moreover, when smoking prevalence in the sample was recalculated standardizing for occupational distribution of the general population, the difference was only 5%. Finally, such issue is not likely to influence any association between smoking status and the variables investigated.

Thirdly, as in all surveys regarding unhealthy behaviors, an under-reporting bias may have occurred in assessing the prevalence of some conducts (e.g. smoking [38] or illegal substance



consumption [39]). We had no opportunity to quantify such bias, though total anonymity was rigorously communicated before compilation. Instead, as regards misclassification of occupational class, there are no reasons to believe that the distribution of misreported and misclassified data should systematically differ across occupational groups. In addition, data were almost complete and less than 5% of missing data were observed for all variables.

With these caveats, our study showed an independent association between specific professional classes and tobacco smoking among young-adult workers, suggesting that occupation may play a role in determining smoking behavior

and should be considered in determining those subsets of populations to which smoking cessation campaigns should be targeted towards first.

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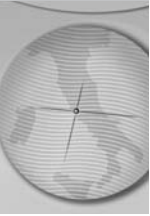
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