



Social determinants of smoking in the population of the Republic of Macedonia – results from a nested case-control study

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ABSTRACT

There is certain evidence that tobacco use is to a big extent associated with adult mortality rates; a condition that can be prevented and halved if widespread cessation of smoking is implemented. In the Republic of Macedonia, data on tobacco smoking is not regularly collected, although Macedonia is ranked amongst one of the top five countries globally in reported smoking rates, including 40% smokers among health professionals.

Data is collected through a “nested case-control study”, conducted in the period between March and December, 2013. “Cases” are households with TB patient(s) registered in the period between July, 2012 and June, 2013 and “controls” are households randomly chosen from the cases’ immediate vicinity and who agreed to participate in the study.

The total population that participated in the study was 562 households with a total of 2720 respondents. 39.73% respondents in the total sample regularly smoke, and the percentage rises to 48.41% when irregular smokers are added. Smoking was strongly associated with gender, place of residence, marital status, education and employment status.

Smoking in the Republic of Macedonia is “socially accepted”, unlike alcohol or psychoactive substances and it is also a unique example of the implementation of a dual policy, having in place a restrictive smoking ban in accordance with EU regulations along with high agricultural subsidies aimed at stimulating tobacco production.

Keywords: TB, tobacco use, regulation, prevalence

INTRODUCTION

There is certain evidence that tobacco use is the leading global cause of preventable death, killing around 6 million people and causing hundreds of billions of dollars of economic damage worldwide each year. It is also the leading cause for most of the deaths occurring in low- and middle-income countries¹. This trend is predicted to continue, despite the established evidence of proven and cost-effective means to combat the epidemic².

Smoking is an important preventable risk factor, along with physical inactivity and poor nutrition that contributes substantially to the development and severity of certain chronic diseases and conditions³, and it is to a big extent associated with adult mortality, estimated indirectly from absolute lung cancer rates. Smoking also indicates substantial social inequalities in mortality⁴, which can be halved if widespread cessation of smoking is implemented. Furthermore, smoking is one of the most important

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and modifiable risk factors associated with adverse perinatal outcomes, estimated to be associated with 15% of all preterm births, 20-30% of all infants of low birthweight, and a 150% increase in overall perinatal mortality⁵. Tobacco smoking also interacts with *M tuberculosis* complex to the extent of promoting infection and disease⁶, and are both public health threats⁷.

There is encouraging evidence that quitting smoking is associated with reduced risk of total mortality⁸, having considerable short-term economic and health benefits, due to reductions in hospitalizations for circulatory diseases, such as myocardial infarction and stroke^{9,10}, therefore understanding of national trends in prevalence and consumption is critical for prioritizing action and evaluating tobacco control progress¹¹.

Self-reported data on smoking is estimated to be reliable in population based surveys¹² and descriptive analyses generally revealed moderate to excellent agreement for all measures of interest^{13,14}.

In the Republic of Macedonia (RM), data on tobacco smoking is not regularly collected, although there are surveys that rank Macedonia as one of the top five countries globally in reported smoking rates¹⁵, with notified high smoking rates of 40% even among health professionals¹⁶. There is no official data on smoking rates in the World Health Organization database, but estimates of diseases rates attributable to smoking range from 106.9/100.000 in males and 3.35/100.000 in females for diseases of the trachea, lung and bronchus to 2150.5/100000 in males and 1559.5/100000 for circulatory diseases, such as ischemic heart disease and stroke¹⁷. Euromonitor International has measured smoking tobacco as experiencing positive growth of 3-4% in volume¹⁸.

Five of the six systematic reviews have found no evidence of any intention to consider the social distribution of effects, and no attempt to stratify summary outcome measures by any sociodemographic variable¹⁹.

The main objective of the study is to estimate the prevalence of smoking among the population in RM, and to analyze social determinants of tobacco smoking, aimed at complex analysis of all factors associated with smoking, in order to provide evidence and recommendations for targeted interventions.

METHODOLOGY

Data was collected through a “nested case-control study”²⁰, conducted in the period between March and December, 2013. “Cases” are households with TB patient(s) registered in the period between July, 2012 and June, 2013 and “controls” are households randomly chosen from the cases’ immediate vicinity, who also agreed to participate in the study. Respondents are interviewed in 8 statistical regions in the Republic of Macedonia with a population of 2.065 769 inhabitants²¹. Informed consent was an integral part of the questionnaire and was obtained from each survey participant. The study was granted ethical approval by the Doctors Chamber in March, 2013.

The study sample was calculated using a statistical program for determining sample size (PEPI 4.04x), by using the following parameters: *average household size 4.5*²¹, *urban/rural ratio 1.5*, *poverty line 28.7*²², applying the study power of 80%, 95% confidence interval and maximum acceptable difference 0.05. The calculated sample of 530 households was increased by 10% to allow for non-response.

Data on smoking was extracted from the module on lifestyle from the WHO World Health Survey questionnaire used for the survey. The instrument is designed to collect broad range of data associated with everyday functioning of households, such as demographic data, economic activity, consumption of goods and services, living conditions, lifestyle, health status and access to health services of household members.

Smoking habits were measured by collecting data on current smoking status, type of tobacco product used and number of cigarettes smoked per day. Face-to-face interviews were performed by trained DOT nurses who visited TB patients 3 times/week. All data on the variables is based on self-reported information.

The instrument was pre-tested on 10% of the sample, with appropriate corrections following feedback from the pre-test, mainly resulting in additional explanations for better understanding of certain questions. The instrument was translated into the Albanian language, to enable the interviewing of some ethnic minorities in RM into their mother tongue.



Data was analyzed with IBM SPSS Statistics, version 19.0 (IBM Corporation, Somers, NY, USA), using descriptive statistics to calculate frequencies and mean values. Chi-square test was used to compare demographic characteristics with the smoking status, and analysis of variance for comparison of the means. Variables significantly associated with smoking at univariate level were included in multiple logistic regression as categorical response variables^{23,24}, to assess the relationship between smoking as a single

categorical response and age, gender, place of residence, region, educational and employment status as categorical explanatory variables.

RESULTS

The total study population was 562 households with a total of 2720 respondents, 53.5% households with a TB patient and 46.5% households as controls. The characteristics of the study population are presented in Table 1.

Table 1 Demographic characteristics of the population in the study (n=2720)

	Cases	Controls	P
Region			
Skopje	47.5%	47.6%	
Polog	15%	14.9%	
South-West	8.5%	8.4%	
South-East	7.4%	7.5%	0.923
North-East	7.3%	7.2%	
Pelagonija	6%	5.9%	
East	5.2%	5.3%	
Vardar	3.1%	3.2%	
Place of residence	52.1%	53.8%	
Urban	47.9%	46.2%	0.412
Rural			
Gender			
Female	36.8%	47.9%	<0.01
Male	63.2%	52.1%	
Mean age of respondents	45.17	47.28	0.084
Mean HH¹ size	4.66	4.36	0.038
Ethnicity	37.3%	44.8%	
Macedonian	50.6%	43.8%	
Albanian	7.5%	6.2%	0.63
Roma	4.2%	4.1%	
Turkish			
Education			
No formal education	2.6%	3.1%	
Unfinished primary school	10%	9.7%	
Completed primary school	41.7%	30.7%	0.032
Completed high school	39.5%	43.4%	
Completed university education	4.5%	9.3%	
Employment status			
Public administration	7%	9.5%	
Self-employed	9.1%	13.1%	
Employer	11.2%	23%	<0.01
Unemployed	72.4%	52.2%	
NGO	0.3%	2.2%	

¹ HH = household

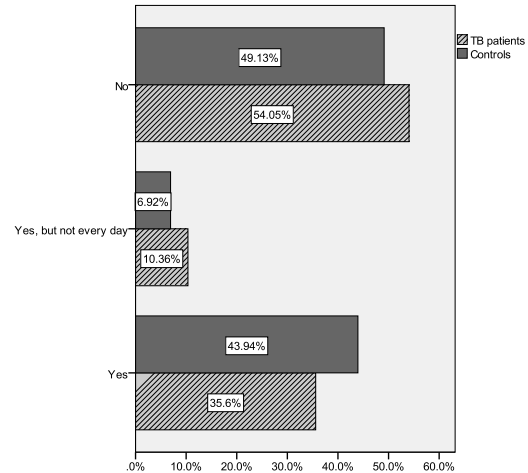
There were respondents representing all 8 regions, as per the statistical division of the country, most of them interviewed in the North-West region, 47.6% in the Skopje region, 14.9% in Polog, South-West 8.4%, South-East and North-East with 7.4% and 7.2%, respectively, Pelagonija 5.9%, East 5.3% and the lowest number in the Vardar region (3.2%), which corresponds to the distribution of TB patients registered in the period between July, 2012 and June, 2013, as the main inclusion criterion for cases. Due to the design of the study, the percentage of controls in the same regions was identical, or negligibly lower or higher compared to cases.

The distribution of respondents by place of residence was quite proportional with 50.9% living in urban and 49.1% in rural areas, with both cases and controls dominantly living in urban areas. A statistically significant difference was observed in gender, with the dominance of male TB cases (63.2% vs 52.1% in the control group). Members of households with TB cases were slightly younger (mean age of 45.17 years ± 15.7 SD, compared to controls with mean age of 47.28 ± 14.1 SD) and lived in statistically significant bigger households of average 4.66 members than HH size of 4.36 in controls. By ethnicity, most of the cases were Albanians (50.6%) or Macedonians (37.3%), followed by Roma (7.5%) and Turkish (4.2%) but, given the study design, there was no statistically significant differences between these groups ($\chi^2=3.458$, $df=5$, $p=0.63$).

The analysis of the answers to the question 'Do you smoke cigarettes, cigars or a pipe?' has identified 39.73% respondents in the total sample as regular smokers, which, if one adds 8.68% respondents who smoke, but are not doing it every day increases to 48.41% smokers. It is characteristic that the percentage of smokers was higher in controls (43.94%) when compared to TB cases who regularly smoke in 35.6%, but percentages were almost equal when those who smoke irregularly were added (45.96% TB cases vs. 50.86% controls). (graph 1)

The average length of smoking status in the whole sample was 18.73 years ± 10.66 SD; cases smoke for a longer period with 19.4 years ± 11.24 SD compared to controls whose average smoking status amounts to

18.04 years ± 10.1 SD, but the difference was not statistically significant ($t=1.096$, $df=295$, $p=0.274$).



Graph 1 Distribution of answers to the question *Do you smoke cigarettes, cigars or a pipe?* In Cases ($n=1455$) and Controls ($n=1265$)

As for the number of cigarettes smoked daily, cases smoke almost identical number of cigarettes compared to controls, with an average of 19.01 cigarettes ± 11.09 SD, compared to controls who smoke 19.04 cigarettes ± 9.41 SD and the difference was not statistically significant ($t=-0.22$, $df=292$, $p=0.982$)

At univariate level, smoking was more prevalent among respondents living in rural areas (50.6%), among male population with 72.3% and who are married (83.3%). Analysed by educational status, the highest percentage of smokers have completed high school education (41.2%) or primary school education (40.8%), while the percentage of smokers among respondents who have completed university education is only 5.5%, and this difference was highly statistically significant. By ethnicity, most of the smokers were Albanians (51.3%), Macedonians (37.8%) or Roma (8%). As for the employment status, somewhat more than half of the smokers were unemployed (53.3%), followed by employers with 24%, self-employed 12% and employed in public administration (9.8%) and the difference between



the groups was statistically significant ($X^2=19.079$, $df=10$, $p=0.039$).

Multivariate logistic regression did not show any association of smoking habits and region where households are located, neither has the ethnicity of

the respondents in both cases and controls. Smoking was strongly associated with gender, place of residence, marital status, education and employment status. (table 2)

Table 2 Adjusted odds ratios for socio-demographic characteristics of current smokers among cases and controls

Social determinant	p	Cases OR (95% CI)	Controls OR (95% C.I.)
Gender			
Female*		1	1
Male	<0.01	5.071 (2.766 – 9.296)	<0.001 3.346 (1.914 – 5.401)
Marital status			
Not married*		1	1
Married	0.176	1.656 (0.797 – 3.440)	0.970 1.025 (0.289 – 3.821)
Separated	0.229	4.848 (0.371 – 63.341)	0.922 1.537 (0.789 – 5.754)
Divorced	0.011	7.398 (1.585 – 14.521)	0.028 3.419 (1.361 – 32.421)
Widowed	0.194	0.409 (0.106 – 1.577)	0.157 0.309 (0.051 – 1.189)
Educational status			
University education*			
High school	0.134	5.708 (0.586 – 5.574)	0.997 9.49 (0.011 – 9.453)
Primary school	0.607	2.648 (0.490 – 14.301)	0.878 2.475 (0.254 – 5.410)
Unfinished primary school	0.016	3.878 (1.865 – 17.399)	0.912 1.110 (0.0241 – 4.985)
No formal education	0.038	5.73 (0.40 – 8.31)	0.954 7.593 (0.578 – 8.974)
Ethnicity			
Macedonian*	0.671	0.633 (0.335 – 1.196)	0.519 0.817 (0.442 – 1.509)
Albanian	0.591	0.817 (0.442 – 1.509)	0.629 1.467 (0.310 – 6.937)
Turkish	0.238	0.394 (0.084-1.848)	0.875 1.386 (0.024 – 7.792)
Roma	0.588	0.730 (0.234 – 2.280)	0.187 2.314 (0.666 – 8.036)
Employment status			
Public administration	0.328		0.441 1.112 (0.932 – 4.654)
Self-employed	0.023	3.456 (1.288 – 4.544)	0.235 3.214 (0.521 – 5.879)
Employer*		1	1
Unemployed	0.006	2.896 (1.361 – 6,165)	0.044
NGO	0.150	1.907 (0.793 – 4.589)	0.162 1.955 (0.652 – 8.254)
Place of residence			
Urban*		1	1
Rural	0.034	0.532 (0.297 – 0.953)	0.019 1.478 (1.228 – 2.659)
Alcohol consumption			
Yes	0.014	4.351 (2.230 – 8.465)	<0.01 2.630 (1.263 – 5.491)

*Reference group, OR = Odds ratio, CI = Confidence interval



Males were 5 times more likely to smoke in cases and 3 times among controls when compared to their female counterparts. Being divorced was associated with more than 7 times statistically significant higher odds for smokers among cases, but this association was not observed in controls. Having completed only primary school education or no formal education was statistically significant among cases with 3.8 times higher odds compared to university education as a

DISCUSSION

The prevalence of current smoking in the study population was 39.73% and 48.41% when smokers who do not smoke every day were added.

Assessment of the social determinants of smokers in our survey has described the basic determinants of smoking habits of participants and has allowed for comparison between the groups and past surveys. The survey has identified almost 40% respondents as smokers, which rises to almost half of the sample if we add those who smoke but are not doing it every day. Statistically significant predictors of smoking were identified in gender, educational and employment status and this finding is consistent with a survey of the smoking habits of workers in the RM²⁵, which identified average prevalence of smoking of 35.4%, ranging from 30.2% for employees in public administration to 43.5% in construction workers. Our results are also consistent with a survey of smoking prevalence in 187 countries in the period between 1980 and 2012²⁶, which ranks Macedonia in the top 10 countries with the highest smoking prevalence for men (46.5%) and 26.7% for women and average increase in the rates of 0.1% every year, as well as among health workers. However, our estimated prevalence is lower than the one in the survey carried out in 2001 which identified 58% individuals who have taken tobacco in their life²⁷.

The smoking habit was associated with place of residence, with higher percentage of smokers living in rural areas, predominantly male, married, who have completed primary or secondary school, are of Albanian, Macedonian or Roma ethnicity and half of them are unemployed. Multiple logistic regression has provided further insight into the social determinants associated with the smoking habits identifying gender, marital status, education and

reference group and 5.73 in respondents with no formal education. However, this association was not observed in controls.

Compared to employers as a reference group, unemployed respondents were 3 times more likely to be smokers in both cases and controls and the likelihood of smoking was 4 times higher in cases and almost 3 times higher in controls if the respondent was regularly consuming alcohol.

place of residence as strong predictors of smoking among both cases and controls. However, our survey has failed to identify any association of smoking with ethnicity and this finding is not consistent with the survey of Roma women that has established evidence of 40% of the Romani women who regularly smoke during pregnancy and both Roma ethnicity and maternal smoking significantly associated with the absence of maternal education²⁸.

The only limitation of the survey is its design, i.e., data is collected through self-reporting, which has been identified as prone to inaccurate responses as a direct result of a social desirability bias, in which respondents provide answers that comply with social norms^{29,30}. In fact, the interpretation of results should be made in the context of the perception of smoking in the Republic of Macedonia as „socially accepted“ behavior, unlike for example, alcohol or other psychoactive substances, although there is no scientific evidence on this statement. In addition, the Republic of Macedonia is perhaps a unique example of implementation of a dual policy³¹, having in place a restrictive smoking ban in accordance with EU regulations and at the same time high agricultural subsidies that are aimed at stimulating tobacco production, which certainly should be subject to further investigation.

In conclusion, our survey has provided an evident baseline of smoking prevalence among the population in the RM and has identified basic social determinants that should be considered when planning targeted intervention programs, in addition to existing restrictive measures, should the country want to reduce tobacco epidemic. Further targeted research is needed to provide evidence of vulnerability of various strata in the society and of the impact of policies on the smoking habits of population.



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