

Cigarette smoking among a sample of PONS study subjects: preliminary assessment

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Abstract

Aim: To evaluate the prevalence, socio-demographic patterns and behavioural characteristics of tobacco smoking in a pilot group of PONS respondents.

Materials and methods: Open-ended prospective cohort study conducted in Świętokrzyskie Province. A pilot group of subjects aged 45-64 years was examined. Data on smoking were collected with the use of the Health State Questionnaire administered by the CAPI method.

Results: 62.6% of males and 45.5% of females participating in the PONS study were ever smokers. In the male population, the percentage of current and former smokers were 19.8% and 42.8%. In females, these percentages were at the lower level of 15.3% and 30.3%, respectively. Self-reported data on smoking prevalence seem to be consistent with objective assessment of exposure to tobacco smoke (measured by carbon monoxide level in exhaled lung air), especially for non-smokers.

Conclusions: The analysis found substantial differences in the level of current and former smoking between PONS study and nation-wide surveys conducted in the adult Polish population. Percentages of current smokers in the PONS study are two or even more times lower, and the prevalence of former smoking is almost two times higher than among adult Poles. The above differences may result from social characteristics of the first group of PONS subjects and their health behaviours. PONS subjects who decided to take part in the first phase of the study are proportionally better educated than a comparable age group of the adult Polish population, and therefore may be more health-oriented than respondents from the general population. Therefore, it is recommended that the next phase of the PONS study should promote and focus on the less educated inhabitants of the study areas, especially males.

Keywords

Cigarette smoking, adult Poles, cohort study

INTRODUCTION

Tobacco is the single most preventable cause of death in the world today, killing up to half the people who smoke or use it in one way or another [1]. Epidemiological estimates show that tobacco use currently kills over 5 million people worldwide each year and, if comprehensive tobacco control strategy and action plans are not urgently and effectively enforced, this figure will rise to more than 8 million a year by 2030 [2].

Although most vast majority of these deaths are expected to occur in developing countries [3], the tobacco epidemic is still one of the major public health challenges in Europe, especially in Central and Eastern European countries [4,5]. In the WHO European region, smoking is responsible for 1.6 million premature deaths and in the enlarged European Union (EU25) smoking kills more than 650,000 people every year [1,6].

For many years, tobacco smoking has been a common phenomenon and crucial element of an unhealthy lifestyle

in Poland [7,8]. In 2002, smoking prevalence among 20-64-year-old Polish males and females belonged to the highest in the countries of the European Union [9-11]. Tobacco smoking is also one of the major causes of mortality in Poland [5,10]. At present, almost 70,000 Poles die from smoking-attributable diseases [1,12]. Most of these deaths (43,000) occurs prematurely (between 35 and 69 years of age) creating a health gap between Poland and Western European countries. In 2002, tobacco smoking was responsible for 53% of difference in life expectancy at birth between Poland and the average in the EU15 countries among the male population, and 35% of the difference in the female population [10].

Tobacco smoking also produces socio-economic losses that mainly result from high tobacco-related mortality, morbidity and disability in the middle-aged, occupationally-active population. International and Polish nation-wide surveys show that smoking prevalence and its health consequences are the highest among the middle-aged, poor and less educated social strata, especially living in economically disadvantaged regions [7,8].

The present paper presents preliminary data on smoking behaviours and habits in a sample of PONS study subjects, a cohort of middle-aged adults living in a poorer part of Poland.

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MATERIAL AND METHODS

The aim of PONS study

The PONS study (Polish-Norwegian Study of Chronic Diseases) is an open-ended prospective cohort study aimed at evaluating the impact of biological and lifestyle risk and protective factors on the health status of the Polish population, especially on the incidence of chronic diseases and quality of life. A detailed description of the study objectives, design and its execution is included in another paper published in this journal [13].

Sample and data collection

The study is set in south-eastern part of Poland in the Kielce region of Świętokrzyskie Province, and is planned to be representative for the general population. In the first phase conducted between September 2010 and December 2011, the recruitment of subjects and data collection was undertaken among 15,000 adults aged 45-64 years who are permanent residents of two distinct geographical areas of the Kielce region: 1) the city of Kielce (60,000 inhabitants aged of 45-64) and the neighbouring rural district (Kielce County with 50,000 inhabitants aged 45-64). Eventually, 100,000 inhabitants of the Kielce region will be invited to participate in the PONS study. It is also planned to conduct follow-up studies at 5-year intervals on representative samples of at least a few thousand surviving subjects. The recruitment of PONS study subjects is undertaken through a media campaign, newspaper advertisements and the broad distribution of leaflets.

Study participants were invited to respond to the Health State Questionnaire, undergo a medical check-up, including a number of clinical and anthropometric measurements (height, weight, hip and waist circumference, blood pressure), and to provide a blood and urine samples for assessing lipid and glucose profiles. All biological samples were collected for long-term storage and analysis in the laboratory.

The Health State Questionnaire was a systematic and structured Computer Assisted Personal Interview (CAPI) administered by trained nurses and completed within about 40 minutes. The questionnaire included data on respondent's health status (including medical history and health self-esteem), demographic and social features (gender, age, marital status, place of residence, education, personal and household income, employment and occupational status), psychological status (depressive symptoms and episodes), and selected lifestyle health behaviours (including active and passive tobacco smoking, alcohol drinking, diet habits, obesity indicators, physical activity). Respondent's answers were sent directly to a data server for further processing and management.

All information collected within the PONS study was confidential and analyzed and published for scientific purposes. The study design was approved by the Ethics Committee of the Maria Skłodowska-Curie Cancer Centre and Institute of Oncology in Warsaw, Poland.

Measurement

PONS study provides information on subject's smoking behaviours, characterizes smoking habits and secondhand exposure to tobacco smoke. These questions were adapted from the Global Adult Tobacco Survey conducted in Poland between November 2009 and March 2010 and other nation-wide surveys on smoking behaviours and habits conducted on randomized samples of the adult (15+) Polish population [8,14].

Smoking behaviours were measured by assessing the prevalence of ever, current, former and never smoking. Ever smokers were defined as those respondents who answered 'Yes' to the question 'Have you ever smoked tobacco daily for at least 6 months?' while never smokers were those who underlined the answer 'No'. The category of ever smokers includes subjects who smoke currently or have smoked daily in the past. Current smokers are those respondents who answered 'Yes' to the question 'Do you smoke tobacco currently?' and includes daily and occasional smokers. Daily smokers are defined as those subjects who answered 'Yes' to two questions: 'Do you smoke tobacco currently?' and 'Have you smoked tobacco daily in the past 6 months?' The category of occasional smokers included those who answered 'Yes' to the first question and 'No' to the second. Former smokers included those subjects who have smoked daily in the past (answer 'Yes' to the question 'Have you ever smoked tobacco daily for at least 6 months?') but do not smoke currently (and underlined the answer 'No' to the question 'Do you smoke tobacco currently?'). 'Do not know' and 'Refusal' answers were not taken into consideration when analysis of smoking behaviours was carried out.

In the PONS study, the following questions were asked, characterizing the smoking habits: 1) on the number of cigarettes smoked daily (among current daily smokers), 2) age at starting daily smoking (among current and former daily smokers), 3) age at stopping daily smoking (among former daily smokers), 4) how long after waking up is the first cigarette smoked (among current daily smokers), and 5) on smoking at night (among current daily smokers). The last two questions were considered as indicators of tobacco dependence. The first question was based on Fagerström's Test for Nicotine Dependence [15]. Smoking at night was proposed as a strong indicator of pharmacological (nicotine-derived) dependence on tobacco [16].

Questions on secondhand exposure to tobacco smoke concerned smoking in the presence of PONS study subject at home and at a work place (in the venue where respondent works).

Participants of PONS study have been also asked to measure the carbon monoxide (CO) content in their lungs (in exhaled air). In epidemiological studies, this assessment is considered as an objective and clinically proven indicator of exposure to tobacco smoke [17]. The CO measurement was carried out by trained nurses with the use of a certified CO monitor.

The aim and design of analysis

The main aim of the current analysis is to evaluate the prevalence, socio-demographic patterns and behavioural characteristics of tobacco smoking in a pilot group of respondents participating in the PONS study. The analysis is focused on patterns of active smoking that is major cause of tobacco-related diseases. Secondhand exposure to tobacco smoke is excluded from current analysis; however, it is planned that its patterns and health effects will be analyzed in a separate paper. Within the current analysis, basic methodological problems of the PONS study have also been investigated, such as the reliability of study questions and the validity and consistency of collected data. For these reasons, the study results were also compared with available data from nation-wide surveys conducted in Polish adult population.

The current analysis is based on the results of the Health State Questionnaire among the first group of PONS subjects,

a total of 3,862 respondents. Descriptive analysis included the following tobacco-related variables: 1) prevalence of such smoking behaviours as ever, current, former and never smoking, and 2) characteristics of smoking habits, including number of cigarettes smoked daily, age at starting and stopping daily smoking, duration of daily smoking, and time to first smoke after waking up and smoking at night as indicators of tobacco dependence.

Using cross-sectional analysis, all the above variables were related to respondent's demographic and socioeconomic status, including gender, age, place of residence, education and income. Data on smoking by age were analyzed in two 10-year age group clusters: 45-54, 55-64. Place of residence was divided into two categories: urban and rural, while the level of education was categorized in three groups: 1) respondents with low education (primary or vocational), 2) medium education (secondary and incomplete high), and 3) university education (with Master degree or higher). Finally, respondent's income was not included into analysis of smoking behaviours because missing values or unreliable data on income were found for many respondents.

Subjective data (based on questionnaire self-reports) on smoking prevalence were validated by measurement of the carbon monoxide content in exhaled air, considered as an objective indicator of exposure to tobacco smoke.

Statistical analysis

Significant differences in distribution of categorical variables (e.g. prevalence of smoking) were expressed in

percentages and tested by chi-square test statistics, while differences in continuous variables (number of cigarettes smoked a day) were calculated in mean values (with standard deviation) and analyzed by Kruskal-Wallis ANOVA test. All statistical calculations were undertaken using Statistica PL software version 8.0.

RESULTS

Smoking behaviors

Table 1 shows data on smoking behaviours (current, former and never smoking) among PONS subjects by selected socio-demographic strata: gender, age, place of residence and education.

Primary results of the PONS study show that 16.8% of respondents declared themselves to be current smokers, 34.4% former smokers, 48.8% never smokers, and 52.2% ever smokers. The gender seems to be strong predictor of smoking behaviours among the studied population, especially for former and never smoking (Table 1). Although gender difference in current smoking was not big (19.8% of males and 15.3% of females, respectively, currently smoked cigarettes), the percentage of former smokers in the male population was substantially higher (42.8%) than in the female population (30.3%). However, stopped smoking ratio, calculated as the proportion of former smokers among ever smokers, was at a similar high level in both gender groups (69% in males, 67.6% in females).

Table 1. Smoking behaviours among PONS subjects by selected socio-demographic strata

| Socio-demographic strata | Current smoking | | Former smoking | | Never smoking | | Ever smoking | | Chi-square statistics for distribution of current, former and never smoking | Chi-square statistics for distribution of never vs. ever smoking |
|--------------------------|-----------------|-------|----------------|-------|---------------|-------|--------------|-------|---|--|
| | N | % | N | % | N | % | N | % | | |
| All subjects | | | | | | | | | | |
| Total (aged 45-64) | 648 | 16.78 | 1,330 | 34.44 | 1,884 | 48.78 | 1,978 | 51.22 | Not applicable | Not applicable |
| Gender: | | | | | | | | | | |
| Males | 255 | 19.77 | 552 | 42.79 | 483 | 37.44 | 807 | 62.56 | Chi ² =101.3987 | Chi ² =100.5617 |
| Females | 393 | 15.28 | 778 | 30.25 | 1,401 | 54.47 | 1,171 | 45.53 | p=0.00001 | p=0.00001 |
| Males | | | | | | | | | | |
| Age: | | | | | | | | | | |
| 45-54 years | 110 | 21.07 | 202 | 38.70 | 210 | 40.23 | 312 | 59.77 | Chi ² =6.0306 | Chi ² =2.9020 |
| 55-64 years | 145 | 18.88 | 350 | 45.57 | 273 | 35.55 | 495 | 64.45 | p=0.0490 | p=0.0885 |
| Residence: | | | | | | | | | | |
| Rural | 81 | 20.45 | 166 | 41.92 | 149 | 37.63 | 247 | 62.37 | Chi ² =0.2426 | Chi ² =0.0083 |
| Urban | 174 | 19.46 | 386 | 43.18 | 334 | 37.36 | 560 | 62.64 | p=0.8858 | p=0.9274 |
| Education:* | | | | | | | | | | |
| Low | 90 | 23.62 | 172 | 45.14 | 119 | 31.23 | 262 | 68.77 | Chi ² =14.2782 | Chi ² =12.8475 |
| Medium | 102 | 19.24 | 230 | 43.40 | 198 | 37.36 | 332 | 62.64 | p=0.0065 | p=0.0016 |
| High | 63 | 16.62 | 150 | 39.58 | 166 | 43.80 | 213 | 56.20 | | |
| Females | | | | | | | | | | |
| Age: | | | | | | | | | | |
| 45-54 years | 201 | 18.89 | 280 | 26.32 | 583 | 54.79 | 481 | 45.21 | Chi ² =24.6895 | Chi ² =0.0759 |
| 55-64 years | 192 | 12.73 | 498 | 33.02 | 818 | 54.24 | 690 | 45.75 | p=0.00001 | p=0.7830 |
| Residence: | | | | | | | | | | |
| Rural | 119 | 15.14 | 203 | 25.83 | 464 | 59.03 | 322 | 40.97 | Chi ² =11.8126 | Chi ² =9.5379 |
| Urban | 274 | 15.34 | 575 | 32.19 | 937 | 52.46 | 849 | 47.53 | p=0.0027 | p=0.0020 |
| Education:* | | | | | | | | | | |
| Low | 87 | 16.23 | 152 | 28.36 | 297 | 55.41 | 239 | 44.59 | Chi ² =6.1006 | Chi ² =2.4510 |
| Medium | 215 | 16.24 | 407 | 30.74 | 702 | 53.02 | 622 | 46.98 | p=0.1918 | p=0.2936 |
| High | 91 | 12.78 | 219 | 30.76 | 402 | 56.46 | 310 | 45.54 | | |

* Low = primary or vocational; medium = secondary or incomplete high; high = university (Master's degree or higher).

Among both males and females, the older PONS subjects had a lower prevalence of current smoking and higher prevalence of former smoking (Table 1). In the male population, respondents in the age group 45 – 54 smoked currently in 21.1%, and the percentages of former and never smokers were at the level of 38.7% and 40.2%, respectively. In comparison, the relevant percentages for older men (aged 55-64) were 18.9%, 45.6% and 35.6%. Age differences in the above-mentioned categories of smoking behaviours were statistically significant ($p < 0.005$). A similar pattern of differences was found among females participating in PONS study. Among the younger females (45-54 years), 18.9% currently smoked, 26.3% had stopped smoking, and 54.8% had never smoked; these percentages in the older group of female PONS subjects (aged 55-64) were as follows: 12.7%, 33.0% and 54.4%. Results of chi-square statistics show that differences in current and former smoking between the younger and older groups of female PONS subjects were highly significant ($p = 0.0001$). In both gender groups, there were no statistical age differences among subjects who ever or never smoked cigarettes. Place of residence did not differ in smoker behaviours in the male population of PONS subjects (Table 1). However, slight but statistically significant differences were found between females living in rural and urban areas among former, never and ever smoking. Females from urban areas tended more often to be ever smokers (47.5%) and former smokers (32.2%) than females from rural areas (41.0% and 25.8%, respectively). On the other hand, women living in villages statistically more often were never smokers (59.0%) than those living in towns (52.5%).

Education seems to be a good predictor of smoking behaviours among male subjects of the PONS study, but does not in differ smoking behaviors among female participants of the study (Table 1). Males with university education were characterized by a lower percentage of current (16.6%) and ever smoking (56.2%), and more often were never smokers (43.8%) than those with low, primary or vocational, education (23.6%, 68.8% and 43.8%, respectively).

Characteristics of smoking habits

Table 2 shows the characteristics of smoking habits among the PONS subjects who currently smoked cigarettes or were former smokers. In both groups of smoking behaviours, the average age at starting daily smoking and average duration of daily smoking have been calculated. Among current daily smokers, duration of daily smoking was calculated in relation to age at starting daily smoking, and time of study fieldwork. The question concerning the number of cigarettes smoked a day was only asked of those participants who currently smoked on a daily basis, whereas age at stopping daily smoking was calculated only for those subjects who successfully quit smoking and did not smoke at the time of the study fieldwork.

Table 2. Characteristics of smoking habit among PONS subjects by smoking behaviour and gender

| Characteristics of smoking habit | Current daily smokers | | | | Former daily smokers | | | |
|---|-----------------------|---------------------|---------|---------------------|----------------------|----------------------|---------|----------------------|
| | Males | | Females | | Males | | Females | |
| | N | Mean (\pm SD)* | N | Mean (\pm SD)* | N | Mean (\pm SD)* | N | Mean (\pm SD)* |
| Average number of cigarettes smoked daily | 255 | 16.82 (\pm 8.31) | 392 | 12.67 (\pm 7.51) | nd | nd | nd | nd |
| Average age at starting daily smoking (years) | 247 | 19.71 (\pm 4.97) | 369 | 21.96 (\pm 6.03) | 552 | 18.77 (\pm 3.62) | 777 | 20.50 (\pm 4.57) |
| Average age at stopping daily smoking (years) | na | na | na | na | 545 | 39.86 (\pm 10.81) | 768 | 39.90 (\pm 10.98) |
| Average duration of daily smoking (years) | 247 | 35.26 (\pm 7.05) | 369 | 32.40 (\pm 7.14) | 542 | 21.10 (\pm 10.76) | 768 | 19.41 (\pm 10.88) |

nd – no data; na – not applicable; * average value was calculated with standard deviation (SD).

Average number of cigarettes smoked a day was 16.8 for males and 12.7 for females who currently smoke cigarettes on a daily basis. Among both current daily and former daily smokers, the average age at starting daily smoking was almost two years later among females (about 22 and 21 years, respectively) than in males (20 and 19 years). In both gender groups, the average age at starting smoking was around one year earlier among former than current daily smokers. No gender difference was found in age at stopping smoking among the PONS subjects who quit smoking (they stopped at approximately the age of 40). Both among current and former daily smokers, average duration of daily smoking was slightly longer among males (35 and 21 years) than in females (32 and 19 years). As current daily smokers still continue smoking, the average duration of smoking was much longer in this population than among those PONS subjects who decided to stop smoking.

Table 3. Indicators of tobacco dependence among PONS subjects who are current daily smokers, by gender

| Indicator of tobacco dependence | Males | | Females | | Chi-square statistics |
|--------------------------------------|-------|-------|---------|-------|--------------------------------------|
| | N | % | N | % | |
| Time to first smoke after waking up: | | | | | |
| Within 5 minutes | 39 | 15.4 | 60 | 15.42 | Chi ² =3.7046 p=0.2952 |
| After 6-30 minutes | 84 | 33.20 | 103 | 26.48 | |
| After 31-60 minutes | 54 | 21.34 | 90 | 23.14 | |
| After more than 60 minutes | 76 | 30.04 | 136 | 34.96 | |
| Smoking at night: | | | | | |
| Yes | 35 | 13.73 | 50 | 12.79 | Chi ² =0.1183 p=0.7309 |
| No | 220 | 86.27 | 341 | 87.21 | |

Table 3 contains data on gender differences in two indicators of tobacco dependence among participants of the PONS study who were current daily smokers. Results of chi-square statistics showed that there were no statistically significant differences in tobacco dependence between smoking males and females. About 15% of PONS subjects smoked a cigarette in the first 5 minutes after waking up, and 13% smoked at night. A slightly bigger group of males (48.6%) than females (41.9%) smoked the first cigarette within 30 minutes after waking up, while slightly more daily smoking females (around 35%) than daily smoking males (around 30%) smoked their first cigarette one hour after waking up.

DISCUSSION

Although the PONS cohort study has different methodology than nation-wide surveys based on representative random sample of the adult population, it is worth comparing whether the PONS results are consistent with these surveys and, if not, explain reasons for this differences.

Primary results of the PONS study show that 62.6% of males and 45.5% of females are ever smokers. For comparison, data on smoking behaviours aggregated for the HEM analytical study from a nation-wide representative questionnaire surveys conducted in 2003 [9] show that the level of ever smoking in the same age group (45-64 years) of males is substantially lower among the PONS subjects than in the adult male population of Poland (72.8%) (Figure 1). However, the prevalence of ever smoking among females participating in the PONS study does not differ from data from the adult female population (47.0%) (Figure 2).

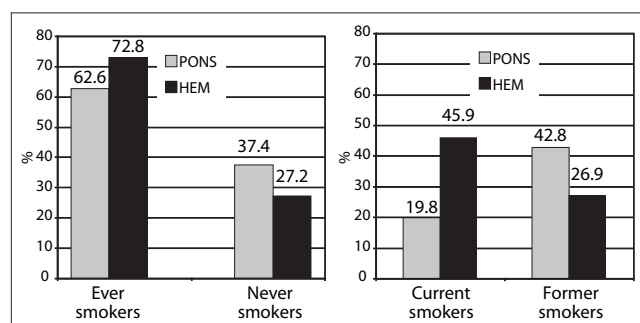


Fig. 1. Smoking behaviors in PONS (2010) and HEM (2002) studies, males aged 45-64

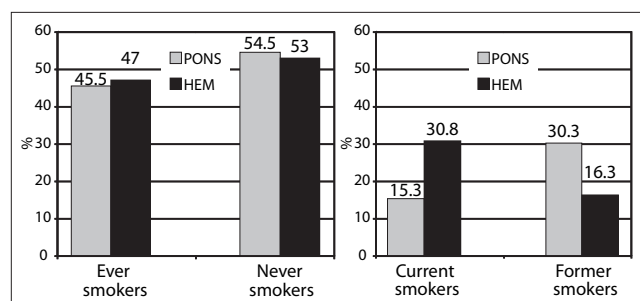


Fig. 2. Smoking behaviors in PONS (2010) and HEM (2002) studies, females aged 45-64

Substantial differences between results of the PONS and HEM studies are observed among current and former smokers, and these differences concern both gender groups (Figures 1 and 2). Compared with results of the HEM study, the percentages of current smokers in the PONS study are two or even more times lower (19.8% for males and 15.3% for females participating in the PONS study, while respective percentages for males and females analyzed in the HEM research project were 45.9% and 30.8%). In contrast to patterns of current smoking in the PONS and HEM studies, the prevalence of former smoking is almost two times higher among the PONS subjects (42.8% in males, 30.3% in females) than among the HEM respondents (26.9% in males, 16.3% in females). Also, the quit smoking ratio (i.e. the proportion of former smokers among ever smokers), is almost two times higher among the PONS than in the HEM study.

Recent data on smoking behaviours from the Global Adult Tobacco Survey (GATS), conducted between November 2009 and March 2010, confirm the above observations [14].

On this basis, it seems that the prevalence of current smoking is lower in the PONS study, while former smoking is higher.

Finally, it seems that the first group of PONS subjects, who were not randomly chosen from the adult population, but invited to participate in the study by using marketing

techniques and educational facilities, would be proportionally more oriented towards health than adults in general.

Although the above-mentioned differences among comparable groups of the PONS and GATS studies, socio-demographic patterns of smoking behaviours and habits are similar in both studies. For example, the PONS findings on tobacco dependence, seem to be consistent with results of other nation-wide surveys conducted among smokers in Poland [14,18].

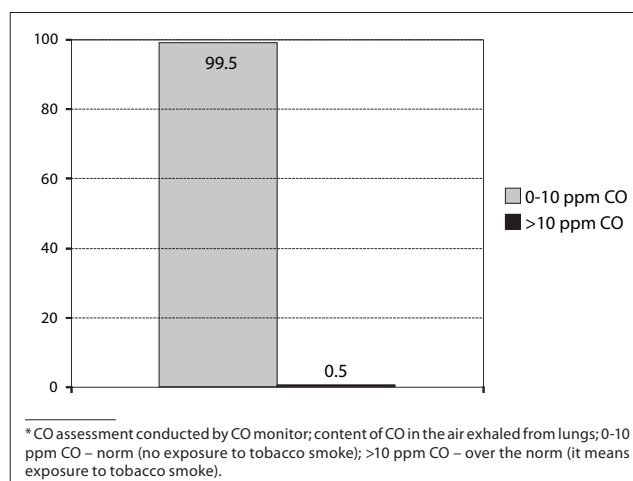


Fig. 3. Values of carbon monoxide measurement among non-smoking PONS subjects*

Moreover, self-reports on smoking behaviours collected from the first group of the PONS study subjects seem to be valid (especially for non-smoking vs. smoking population) as they are consistent with results of carbon monoxide assessment, evaluated as an objective test of exposure to tobacco smoke. 99.5% of non-smokers had a low concentration of carbon monoxide in their lungs (0-10 ppm CO) which objectively indicates the lack of exposure to tobacco smoke (Figure 3).

CONCLUSIONS

Patterns of ever and never smoking seem to be similar in the PONS study and nation-wide representative surveys conducted among the Polish adult population. However, prevalence of former smokers is appreciably higher in the studied sample. Despite these differences the socio-demographic characteristics of current smokers is in the studied sample similar to other groups of smokers in Poland. Percentage of current smokers in the studied sample is lower in quantity but has similar quality characteristics. For instance PONS findings on tobacco dependence are consistent with results of other nation-wide surveys conducted among smokers in Poland. They also seem to be valid as self-reported and more objective data (measured by CO monitoring) are consistent, especially for non-smokers.

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