

Consequences of smoke inhalation in the 'Epidemiology of Allergic Diseases in Poland' project (ECAP)

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Abstract

This paper presents a risk assessment of individuals with respiratory allergies who are exposed to active and passive tobacco smoke (environmental tobacco smoke or ETS). Smoking tobacco and ETS is a serious environmental hazard known to be harmful to human health. This analysis is based on the results of the Epidemiology of Allergic Diseases in Poland (ECAP) study, which was conducted from 2006-2008 on a sample of approximately 22,500 respondents in 9 areas of Poland, both urban and rural. Data collection was based on individual interviews and a questionnaire employing Computer Assisted Personal Interviewing technology (CAPI). 46.8% of respondents declared themselves as smokers, defined as those who smoke and have done so for at least one year. In this group, 41.5% of respondents were female and 54.3% were male. While differences between various areas of Poland were demonstrated, they did not necessarily correlate with urbanization. Rural Zamość reported 41.4% of smokers while metropolitan Poznań had 41.9% of smokers. These statistics can be contrasted against other urban areas such as Katowice and Gdansk, which had 51.8% and 52.3% of smokers, respectively (n = 9376). 29.6% of rural women reported smoking, while this percentage was higher among urban women, ranging from 36.3% in Poznań to 49.5% in Gdańsk. However, the highest percentage of smokers was among males in Zamość at 56.1%. This percentage was higher than the overall average in this study. The largest percentages of active smoking occurred among laborers, craftsmen, miners, drivers, farmers and fishermen, the self-employed and gardeners. This quantitative assessment of the prevalence of smoking underlines the importance of the consequences of this habit as they relate to asthma and respiratory allergies. The findings demonstrate smoking as a serious social problem associated with allergic diseases, and a habit that differs between place of residence and work environment.

Key words

Tobacco smoke, environmental risk factors – ETS environmental tobacco smoke, ECAP in Poland, asthma, allergic diseases, respiratory tract diseases, work environment

INTRODUCTION

Tobacco smoke and ETS is a deadly killer and is the only hazardous environmental factor that can be completely removed from the environment through conscientious action. It should be noted that lifestyle and avoidance of risky behaviours have more than a 50% impact on our health [1]. The Protection of Health Against the Consequences of Tobacco Use and Tobacco Products Bill was enacted to protect non-smokers in Poland [2, 3]. This law regulated critical issues regarding reducing the risks of tobacco-related diseases, and was of significant importance for taking control of the nicotine addiction epidemic that affects approximately 9 million Polish adults. The legislation was very highly assessed by the WHO and the European Union. Furthermore, on 15 November 2006, Poland ratified the Treaty of the WHO Framework Convention on Tobacco Control (FCTC) which aimed at limiting the health consequences of smoking. 168 countries have adopted the treaty and it is legally binding in 124 countries, encompassing 2.3 billion people. The Bill

of 8 April 2010 has also created more tobacco-free spaces in public, around health-care related properties, schools, and workplaces in Poland [4]. The fourth version of the National Health Programme (NHP) for 2007-2015 has placed reducing the prevalence of smoking first in its plan to promote better health [5].

The WHO recognizes smoking as a chronic, relapsing disease caused by nicotine addiction. The disease is listed under F17 in the International Classification of Diseases, defining it as a psychological and behavioural disorder. Smoking is one of the most considerable risk factors for chronic cardiovascular diseases, cancer, and respiratory diseases. Smoking constitutes not only the active inhalation of tobacco smoke, but also passive exposure. Tobacco products such as cigarettes, pipes, and cigars, are the main and best documented risk factor for chronic obstructive pulmonary disease (COPD). Furthermore, the level of risk has been shown to be directly related to the dosage of tobacco [6,7]. Smoking also increases the likelihood of adverse effects from nearly every sickness that can affect a mother and her baby, and is the strongest single modifiable cause of disease and death in mothers and neonates [8,9]. Tobacco can also act as an allergen, and has the ability to induce the production of specific IgE antibodies [10] which favour the development of allergic diseases, including asthma, in both children and

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adults [9,11-15]. Due to allergen properties of tobacco, tobacco addiction – as it is related to asthma and respiratory allergies – has been the topic of increased study [16,17]. Smoking has been recognized as a relative risk factor that facilitates the development of asthma. Along with exposure to other allergens, recurrent respiratory infections, certain nutrients and drugs, smoking, including secondhand smoke, is a factor in exacerbating the symptoms of asthma [17]. 19% of Polish non-smokers (24% male and 14% female) are exposed to second-hand smoke at work, while 25% (20% male and 29% female) are exposed to smoke at home. The scale of passive exposure to tobacco smoke among children in Poland is enormous. Every day, about 4 million Polish children passively inhale tobacco smoke at home or in public places [18].

Tobacco smoke contains about 4,000 chemicals, over 40 of which have been proved to be carcinogenic in humans [19]. Cigarettes are therefore the only legally sold product with proven carcinogenic effects. Tarry substances, many of which are carcinogens, irritate lung tissue and can lead to chronic inflammation and cancer. Tobacco smoke plays an essential role in the pathogenesis of cancer of the larynx, pharynx and lungs. Moreover, it increases the risk of asthma and non-specific chronic inflammation of the respiratory tract. Health hazards can also arise from the adverse interaction of tobacco smoke and other harmful environmental factors. These substances act mainly as irritants in the airways. They include compounds that constrict bronchi and cause coughing, compounds that impair movement of cilia in the respiratory tract, which interferes with the self-cleaning properties of the bronchi and lungs, and lead to more frequent infections, and compounds that stimulate mucus secretion, which can cause partial or total obstruction of the bronchi. More detailed effects of tobacco smoke on the human immune system are described in works of H. Siwińska-Gołębiowska et al. [20]. The problem of active and passive smoking in relation to allergic diseases is a public health problem. The life expectancy of a smoker, on average, is 14 years shorter than that of an otherwise equal non-smoker [21].

Mission Statement. Each year, about 5 million people die of tobacco-related diseases. 100,000 deaths in Poland have a direct relationship with the negative effects of smoking (60% of them are people aged 35-69 years). Furthermore, tobacco is a major factor in respiratory diseases, including allergic diseases. The problem of active and passive smoking has become an important part in the study of ECAP, the Polish branch of the European project ECRHS II [22].

The aim of this study was to determine the risk for people with respiratory allergies actively or passively inhaling tobacco smoke, which is a major environmental risk factor. The results of this study can serve as the basis for inference about the significance of smoking in asthma and respiratory allergies in Poland, and for smoking as a social problem in connection with allergic diseases and the work environment.

MATERIALS AND METHODS

The Epidemiology of Allergic Diseases in Poland (ECAP) study was carried out in 2006-2008 in 9 research areas located in different Polish provinces. Data-gathering was based on individual interviews and a questionnaire employing CAPI (Computer Assisted Personal Interviewing) technology.

Individual interviews were recorded using Personal Digital Assistant (PDA), and the data collected was transmitted via wireless information techniques (GMS /GPRS) to a central database. Such high-tech transmission provided high data reliability and security, and allowed a very detailed and versatile statistical analysis.

Three main factors were taken under consideration, when selecting the 9 research areas:

- 1) geographic location (taking into account vegetation periods and the resulting differences in the presence of pollen);
- 2) number of residents (metropolitan areas with at least 150,000 residents);
- 3) environmental pollution.

The cities selected were: Warsaw, Lublin, Białystok, Gdańsk, Poznań, Wrocław, Katowice, and Kraków. This selection guaranteed compliance with urban requirements, but provided areas of differing building and population density (e.g. 3.3 thousand people per km² in Warsaw, and less than 1.8 thousand in Gdańsk). A rural area consisting of 2 adjacent counties, Krasnystaw and Zamość in the Lublin province, was selected for comparison. Due to their very low environmental pollution and natural agricultural character, these counties fully met the afore-mentioned 3 requirements.

Because the ECAP project was part of the ECRHS II European project, it was necessary to ensure the greatest compatibility with the research carried out in other countries, while taking into account some cultural differences. The original ECHRS II questionnaire, translated into Polish, was used for adults in this project. The sample tested included adults at the ages of 20-44 (following the ECHRS standards), and children at the ages of 6-7 and 13-14 (following ISAAC standards). The entire sample size was 22,500 people. All the respondents were randomly chosen from the national PESEL (Polish Social Security Number) database of 99,500 people. 18,617 results were accepted for the statistical analysis; 9,998 were females and 8,591 were males. The purpose of the project was to investigate the prevalence of certain allergic diseases, their symptoms, and any additional unique characteristics exhibited by the respondents. Data was gathered through a series of questions, of which most only had a Yes/ No answer choice. Answers such as 'I don't know' were not available, and if the respondent wrote such a response, the answer was coded as 'no answer'. The total number of questions was 400, but based on respondent's answers to previous questions, an advanced question filtering system selected only questions applicable to the respondent. Questions regarding active smoking were asked only of adults. Second-hand smoking, however, was studied for the whole sample [22].

The data pertaining to tobacco smoke exposure were defined with the help of the questions below; vxxx = ECAP dependent variables number, n = the number of people:

- v273 Have you ever smoked tobacco for at least a year?
n = 9,376.
- v274 How old were you when you started smoking?
n = 4,398.
- v275 Have you smoked in the last month? n = 4,402.
- v276 How much tobacco did you smoke in the last month?
n = 2,932;
number of cigarettes per day; number of cigars/grams of pipe tobacco smoke per week.
- v277 Have you stopped or limited smoking? n = 2,972.
- v280 Do you inhale the tobacco smoke? n = 4,402.

- v285 How many hours a day are you exposed to second-hand smoke from the following sources: at home / at work/ in bars, restaurants, pubs, or other meeting places/ other? n = 7,321.
- v160 Have you ever suffered from asthma? n = 18,617.
- v161 If yes, was asthma diagnosed by a doctor? n = 875.
- r622_1 (v622) Has a specific type of asthma been diagnosed? n = 4,783.
- v136 Have you experienced wheezing /whistling sounds in your chest in the last 12 months? n=18,617.
- v137 When you experienced wheezing, were you able to take a breath? n = 2,519.
- v138 Have you experienced such wheezing /whistling sounds while you had a cold? n = 2,519.
- v140 Have you experienced shortness of breath while resting in the last 12 months? n=18,617.
- v142 Has shortness of breath ever woken you up from sleep in the last 12 months? n=18,617.
- v143 Has shortness of breath ever woken you up from sleep in the last 3 months? n=867.
- v144 Has the shortness of breath woken you up from sleep at least once a week, on average, in the last 3 months? n = 438.
- v146 Has a cough woken you up from sleep in the last 12 months? n=18,617.
- v147 During the winter, is coughing the first thing you do when you wake up in the morning? n=18,617
- v148 Do you cough regularly during the day, or at night during the winter? n=18,617.
- v149 Does the cough persist most days for at least 3 months in a year? n = 6,457.
- v176 Do you suffer from nasal allergies, including pollen allergies (hay fever)? n=18,617.
- v178 Have you ever experienced problems with sneezing or with a runny or stuffed nose at times when you did not have a cold, fever or flu? n=18,617.
- v179 Have you experienced problems with sneezing or with a runny or stuffed nose at times when you did not have a cold, fever or flu in the last 12 months? n=6,735.
- v199 Do you have nasal polyps? n=18,617.
- v494 Have you ever had to quit your job because of breathing problems? n = 8,213.

Dependent variables were defined by the questions in the main questionnaire, taking into consideration the number of respondents answering those questions. Independent variables were defined in the initial database. Under certain circumstances, however, additional independent variables were defined, such as the definition of a smoker. In some analyses, independent variables were defined by the respondents' answers, or by variables previously used as dependent variables. This approach applied particularly to the analysis and assessment of risk. The degree of risks was quantified through odds ratio (OR) and the parameters of logistic regression for dichotomous variables. The odds ratio, calculated from contingency tables, is commonly used as a measure of exposure to an agent. The degree of risk of exposure to tobacco smoke was assessed by the odds ratio measuring the exposure to an epidemiologic agent (in the 95% confidence interval denoted with 95% CI) as it relates to the different types of allergic symptoms.

RESULTS

Epidemiology of smoking. People who declared smoking for at least a year usually began smoking at about 18 years of age (mean 17.8 ± 3.1). The number of cigarettes smoked per day averaged 15.1 ± 11.9 (Tab. 1). Only a small number of respondents declared using other tobacco products (less than 1%).

Table 1. Selected variables regarding active tobacco smoking among respondents of ECAP

Tobacco Smoking	Mean	SD	No.
Initiation age	17.8	3.1	4,320
Number of cigarettes a day	15.1	11.9	2,897
Percent of patients who quit or limited smoking tobacco	57.7	8.8	4,402
Number of cigarettes a day after limiting smoking	14.7	9.70	520

Smokers were identified based on the answers to several specific questions. The analysis took into account the different tobacco consumption methods and inhalation types (active or passive). Smoking for a year or longer (v273) was declared by no less than a half of the respondents (n = 9,376) in certain research areas, with the mean being 46.8%. Fewer females reported smoking (41.5%) than males (54.3%). While differences between various areas of Poland were demonstrated, they did not necessarily correlate with urbanization. Rural Zamość reported 41.4% of smokers while metropolitan Poznań had 41.9% of smokers. These statistics can be contrasted with other urban areas such as Katowice and Gdansk, which had 51.8% and 52.3% of smokers, respectively (n = 9,376). 29.6% of rural women reported smoking, while this percentage was higher among urban women, ranging from 36.3% in Poznan to 49.5% in Gdansk. However, the highest percentage of smokers was among males in Zamość, at 56.1%. This percentage was higher than the overall average in this study.

On average, more than two-thirds (67.1%) of respondents (n = 4,402) declared smoking in the last month (v275). Of these, 64.6% were male and 69.9% were female. Again, a difference between regions existed, but was not related to the level or urbanization. 65.4% of rural Zamość and 62.2% of metropolitan Bialystok declared smoking in the last month, compared to 71.3% and 73.2% in metropolitan Katowice and Poznan, respectively.

More than half, 57.7%, of the respondents declared that they had either quit or limited smoking (v277). An average of 62.7% of females and 52.4% of males reported affirmatively to this question. Attempts to quit or cut down on smoking were more prevalent in urban areas. 71.2% of respondents tried in Gdansk, over 60% in Warsaw, Bialystok, and Katowice, while only 52.9% in rural Zamość.

Reducing or quitting smoking resulted in reduced tobacco consumption among the study sample as a whole, but this decrease was small. The average number cigarettes smoked changed from 15.1 ± 11.9 to 14.7 ± 9.7 when taking this factor into account. The same phenomenon was seen for other types of tobacco products, with the exception of cigars. However, tobacco use other than cigarettes was only declared by less than 1% of the respondents.

Inhaling the tobacco smoke was declared by almost all smokers (94.8%) There were no differences in tobacco inhalation habits across gender or region.

Smoking was found to significantly impact the following diseases and symptoms:

wheezing or whistling (v136), nocturnal cough (v146), chronic cough in the morning in winter (v147), chronic cough (v149), allergic rhinitis, sneezing, rhinorrhea and nasal congestion (v179, r179), nasal polyps (v199), and shortness of breath (v140, v142) (Fig.1). Smokers experienced more frequent allergic rhinitis, including hay fever (v176) than non-smokers.

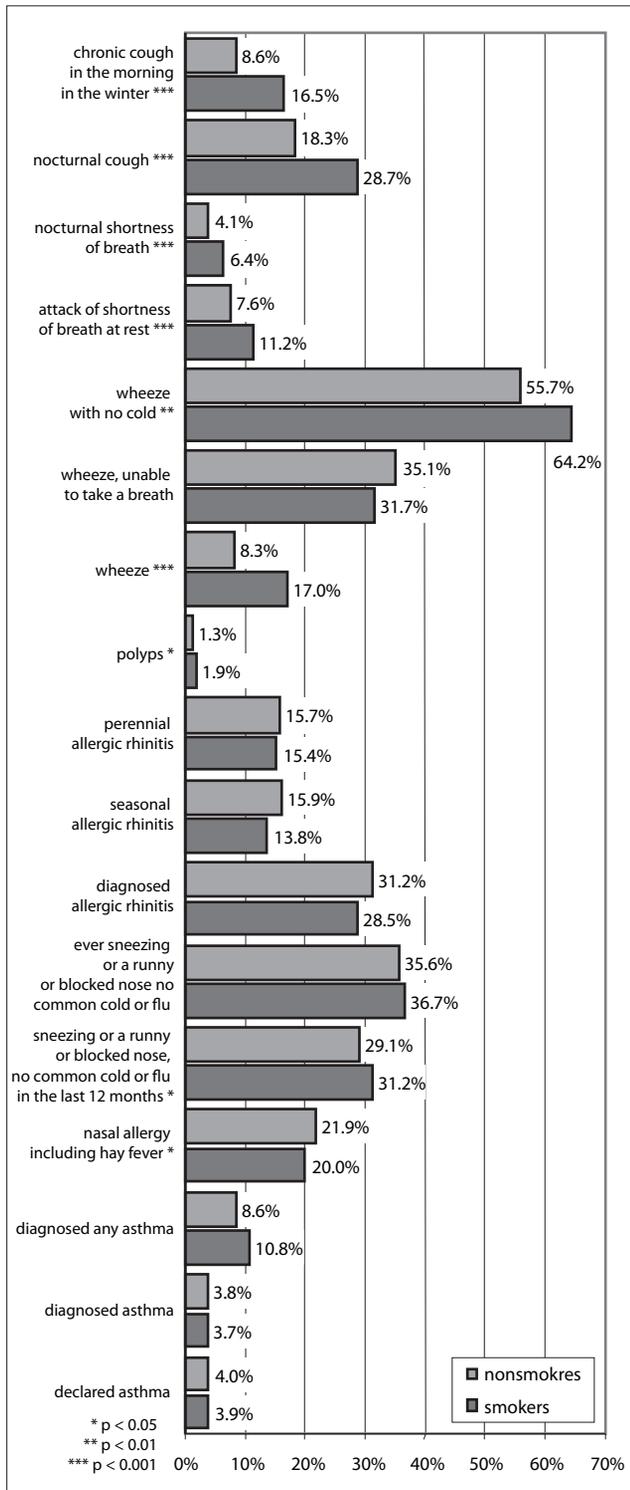


Figure 1. Effects of tobacco smoke on asthma and rhinitis. Significance levels at: * p < 0.05; ** p < 0.01; *** p < 0.001)

Allergic symptoms in the respiratory tract among smokers (Fig. 2) mainly included:

- wheezing or whistling – OR 2.26, 95%CI [1.99-2.57];
- chronic cough in the morning in winter – OR 2.10, 95%CI [1.85-2.39];
- nocturnal cough – OR 1.79, 95%CI [1.63-1.98];
- nocturnal shortness of breath – OR 1.62, 95%CI [1.34-1.95];
- attack of shortness of breath at rest – OR 1.53, 95%CI [1.33-1.77];
- nasal polyps – OR 1.51, 95%CI [1.08-2.10].

Active smoking among patients with allergic diseases compared to non-smoking patients increased the incidence of symptoms such as wheezing, coughing, chronic cough in the morning in winter, and shortness of breath during the night and day.

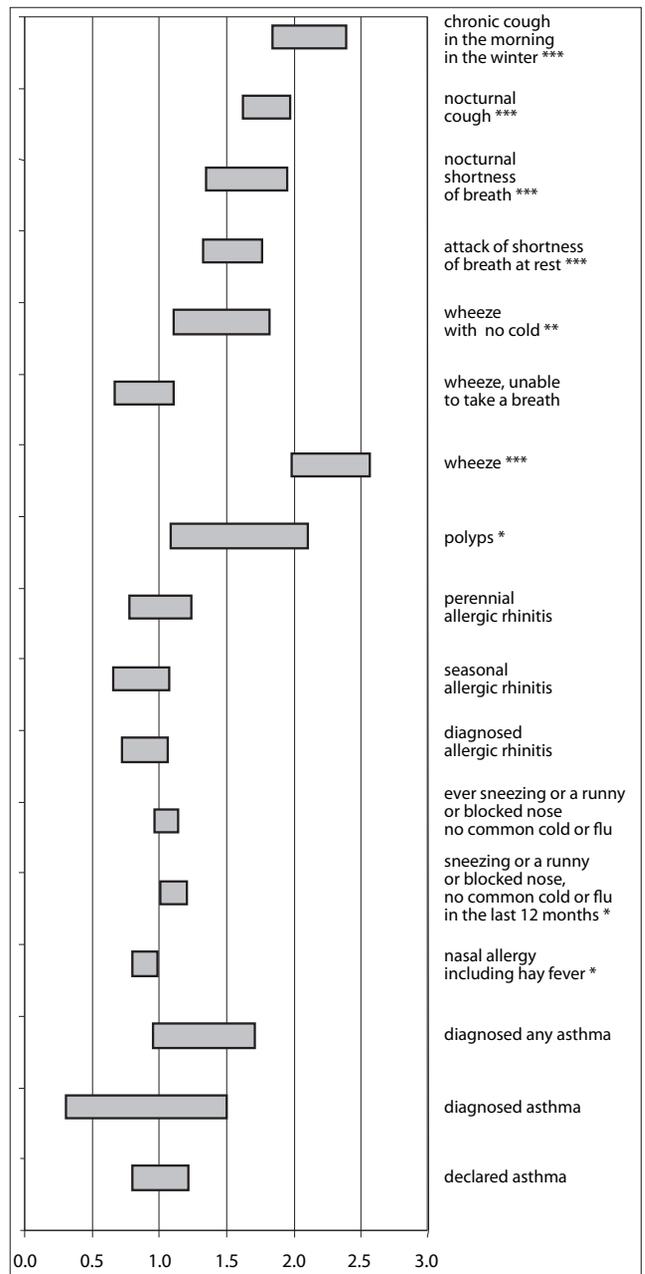


Figure 2. Odds ratio indicating impact of smoking for 12 months on the formation of symptoms and syndromes. Significance levels at: * p < 0.05; ** p < 0.01; *** p < 0.001

The risks of second-hand smoke. The mean exposure to ETS depends on age groups. The exposure of children in the groups aged 6-7 and 13-14 was 28.7% and 33.1%, respectively. Furthermore, a surprisingly large 47.3% of respondents declared having been regularly exposed to ETS in the last 12 months. Of these respondents, an average of 44.4% were female and 55.6% were male.

Two of the factors determining the extent of smoke exposure are family size, excluding the respondent, and the place where the respondents spend most of their time throughout the day. The longest exposure period was at work, with 4.58 hours of tobacco smoke exposure, and at home, with 4.24 hours of exposure. These exposure times are about twice as long as exposures at any other venues, such as bars or restaurants. Almost one-third of respondents reported ETS exposure in their work areas, with an aggregate 3.96 hours of exposure. Furthermore, 29.1% of smokers reported additional ETS exposure at the workplace (1.4% of respondents did not answer this question, impacting the above statistic). About 30% of passive smokers also reported ETS exposure in the workplace.

Passive smoking caused both upper and lower respiratory tract symptoms at a statistically significant level for the following: wheezing or whistling, nocturnal cough, chronic cough in the morning in winter, nocturnal shortness of breath, asthma, allergic rhinitis, sneezing, rhinorrhea, and nasal congestion.

More than a half of respondents were employed full-time, one-sixth of the respondents were either employed part-time, and 5% of respondents were unemployed or were staying at home. The types of occupations with the highest prevalence of smoking (average 31.7%) were blue-collar jobs. Respondents such as construction workers, craftsmen, miners, industrial workers, drivers (over 50% smokers), as well as self-employed farmers, fishermen (48.2% smokers), and gardeners (48.0% smokers) had the highest prevalence of smoking.

The effects of smoking on the respiratory tract may have a significant impact on the health of the employee. Job resignation due to breathing problems (v494) was reported for the following reasons, listed in order of significance level ($p < 0.05$):

- asthma (v160) OR 11.39; 95%CI [7.27-17.86]
- shortness of breath (v140, v142) OR 6.61; 95%CI [4.37-9.99]
OR 6.48; 95%CI [4.07-10.31]
- wheezing or whistling (v136) OR 6.16; 95%CI [4.12-9.20]
- chronic cough in the morning in winter (v147) OR 5.01; 95%CI [3.33-7.55]
- nocturnal cough (v146) OR 4.71; 95%CI [3.14-7.07]
- rhinitis (v178) – excessive sneezing, or a runny or stuffed nose, OR 5.37; 95%CI [3.40-8.47]
- hay fever (v176) OR 4.30; 95%CI [2.87-6.44]
- chronic cough (v149) OR 3.25; 95%CI [2.00-5.27]

DISCUSSION

In the ECAP study, almost half of the respondents were smokers, defined as those who have smoked for a least one year. In this group, 41.5% were female and 54.3% were male. Furthermore, smoking throughout the entire previous month was declared by over two-thirds of the respondents (64.6% of

females and 69.9% of males). This reflects the high prevalence of smokers in the population. The average of the number of cigarettes smoked per day was 15.1 ± 11.9 . This result did not differ significantly by research area according to the surveys conducted between 2007 and 2008 in Poland.

The Estimator survey [23], conducted in 2007 on a nationwide random sample of 6,567 adults, including 1,517 smokers, showed that 7 million Poles were cigarette smokers. This represents 23% of adults, 28% of men, and 19% of women. The largest number of smokers (30%) belonged to the group aged 40-49 years. The number of cigarettes smoked in a day by an average Polish smoker, according to the Estimator, was 16, which translates to about 6,000 cigarettes in a year (about 300 packages), and about 42 billion cigarettes smoked by the entire 7 million smoking population in Poland in one year.

A 2008 survey conducted by CBOS on a random sample of 1,137 adult Polish residents did not show significant differences from the number of smokers in the 2007 Estimator survey. Almost one-third of Polish adults (32%) smoke cigarettes. Males smoke more commonly than females. Two-fifths (40%) of males smoke and one-fourth (25%) of females smoke. In this respect, the results of the 2 studies were almost identical. The fact that Poles smoke less than they did 11 years ago can be attributed mainly to a smaller percentage of males smoking, while the percentage of female smokers has stayed virtually the same. The youngest respondents (from 18 - 24-year-olds) smoke relatively the least, with a small percentage of students being smokers [24].

The Global Adult Tobacco Survey (GATS), a survey conducted in 16 countries which make up half of the world's smoking population, studied tobacco use in adults aged 15 years or older. The survey showed that 27.0% or 8.7 million adult Poles smoke tobacco daily. Among males, 33.5% (5.2 million) were every-day smokers and among females, 21.0% (3.5 million) were every-day smokers. 3.4% (1.1 million) of Poles were occasional smokers – 3.3% (0.5 million) males and 3.4% (0.6 million) females. Over 50% of those surveyed admitted willingness to quit smoking [25].

Similarly, over half of the ECAP respondents declared that they had stopped or limited smoking (57.7% of respondents). Reducing or quitting smoking resulted in reduced tobacco consumption among the study sample as a whole, but this decrease was small. The average number cigarettes smoked changed from 15.1 ± 11.9 to 14.7 ± 9.7 when taking into account this factor. A similar phenomenon was observed for other types of tobacco products, except cigars. Quitting or limiting smoking was reported by 62.7% women, which is especially important because female tend to become addicted faster, and find it more difficult to quit the addiction than men.

The topic of the 2010 Nationwide Campaign organized to celebrate International No-Tobacco Day was inspired by 2 initiatives. The first was the WHO project 'Gender and Tobacco', with particular marketing efforts directed at women. The second initiative was a Reduction of Health Effects of Smoking Programme for the years of 2010-2013. In 2010, the programme focused on women who were pregnant, may have become pregnant, or were young mothers. Reducing the frequency of smoking among young, 20-29-year-old women in the 1980's was the main reason for reduction in the incidence of cancer in this age group. According to the ECAP programme results, 44.4% of women were exposed to tobacco smoke in the last 12 months. Research in Estonia by M.L. Larsson et al. further indicates that females may be more

vulnerable to the harmful effects of ETS. The major health risks associated with tobacco smoke exposure is an argument for a total ban of smoking at work and in public [26].

Results of the ECAP indicate that an average exposure to ETS increases proportionally with age. The range of exposure for children in the age groups 6-7 and 13-14 was 28.7% and 33.1%, respectively. A staggering 47.3% of respondents reported regular exposure to ETS in the last 12 months. J. Szymborski et al. wrote a paper on epidemiology and health effects of second-hand smoke [27] in which he described 2 factors affecting the degree of exposure to smoke: family size and the place where the respondents spend most of their time throughout the day. The longest ETS exposure periods were found to be at work and at home, both with a more than 4 hour exposure time. These exposure times are about twice as long as exposures at any other venues, such as bars or restaurants. Almost one-third of respondents reported ETS exposure in their work areas, with an aggregate 3.96 hours of exposure. Furthermore, 29.1% of smokers and 33.3% of non-smokers reported additional ETS exposure at the workplace. Smoking was found to significantly impact the following diseases and symptoms: wheezing, coughing, cough exacerbations, chronic cough, allergic rhinitis, sneezing, rhinorrhea and nasal congestion, shortness of breath, and asthma.

Scientific research confirmed that the health consequences of both active and passive smoking are the same, and involve cancer, cardiovascular and respiratory diseases, including COPD, bronchitis and asthma [11]. According to A.J. Sasco et al. [28], the risk of cancer for non-smokers living with partners who smoke at home increases by about 20-30%, and by about 16-19% when non-smokers are exposed at work. Reports from the US Surgeon-General point out the risks of second-hand smoke and asthma incidences, both among children [9] and adults [14, 15]. Additionally, the report suggested an increased risk of developing allergies and causing deaths [9], as well as exacerbation of asthma and allergies among children [12]. Active [13] and passive smoking [29] can induce asthma attacks in both adults and children [30, 31, 32]. The Australian National Asthma Council demonstrates ETS as probably the most important polluting factor indoors, and that ETS is particularly dangerous to children. It should be noted that Australian residents, like most Westerners, spend 90% of their time indoors, at homes, schools, offices and public buildings. Parents who are smokers, especially mothers, increase the incidence of asthma in their children, and further ETS exposure potentiates the symptoms of this disease. Many adults diagnosed with asthma admit that second-hand smoke triggers their asthma symptoms [33].

In the Third National Health and Nutrition Survey in the USA, conducted from 1988 - 1994, P.J. Gergen et al. [34] measured the impact of ETS on the health of young children from 2 months to 5-years-old. The ETS exposure among children is prevalent in the USA. About 38% of children were exposed to ETS at home, with 23.7% of them being exposed throughout pregnancy. ETS exposure increased the incidence of chronic bronchitis, 3 or more episodes of wheezing in children aged 2 months to 2 years old, and asthma in children aged 2 months to 5 years old. The reported prevalence of asthma, wheezing, and chronic bronchitis increases with exposure to ETS. These findings reinforce the need to reduce the exposure of young children to ETS. M.L. Larsson et al. [26] studied 3 regions in Estonia to determine the correlation between ETS exposure and respiratory tract

complications. Exposure to ETS at home was more prevalent among females (31% of females, compared to 19% of males), but more prevalent among males outside the house (53% of males, compared to 7% of females). Additionally, females reported more smoking-related health complications (37.7% of females, compared to 21.6% of males). If ETS exposure outside the home was more than 5 hours a day, the risk of wheezing and asthma was increased. ETS exposure outside the home was strongly related to all respiratory tract complications. The study suggests that ETS poses more risks to females than males, and that second-hand smoke is a serious health threat. The conclusions of the study reiterate the need for a ban on smoking in the workplace and public places.

When considering second-hand smoking, 2 types of smoke must be considered. The first type is the main smoke stream, defined as the smoke inhaled and exhaled by the active smoker. The second type is the side-stream, defined as the smoke released into the atmosphere from the smoking cigarette. This smoke contains the most toxic substances, as it is not filtered by a cigarette filter. A smoking cigarette releases 70 mg of carbon monoxide, of which up to 50 mg are contained in side-stream smoke. Furthermore, the concentration of nitrosamine, a derivative of nicotine, is 50 times greater in the side smoke than the main smoke. When considering nitrosamine consumption, spending an hour in a room full of cigarette smoke compares to smoking 35 cigarettes. According to M.S. Jaakkola and J.J.K. Jaakkola, the adverse respiratory tract effects of ETS exposure, both at home and at work, call for the creation of opportunities to prevent such exposure [16, 35].

94.8% of ECAP study respondents declared inhaling tobacco smoke when smoking, either currently or in the past. There were no differences in tobacco inhalation habits across gender or region. Smoking is not only a physiological nicotine addiction, but also a behavioural, psychological and social habit, which, unfortunately, is still a huge societal problem in Poland.

Allergic symptoms of the respiratory tract among smokers cited in the ECAP study were as follows, ordered by frequency: wheezing – OR 2.26, coughing – OR 2.10, cough exacerbations – OR 1.79, shortness of breath at night – OR 1.62, shortness of breath during the day – OR 1.53, and nasal polyps – OR 1.51.

Compared to non-smokers, active smokers experience an increased incidence of allergic diseases, such as wheezing, coughing, cough attacks, and shortness of breath. This correlation of respiratory tract diseases with active smoking confirms that smoking is a strong risk factor and one of the major causes of respiratory illnesses. P. Plaschke et al. studied the impact of certain risk factors on the emergence and re-emission of allergic rhinitis and adult asthma in Sweden. A strong association between smoking and incidence of atopic asthma was shown (OR 5.7). Pollen and pet allergies constituted risk factors for the development of rhinitis, while rhinitis, pet allergy and smoking constituted risk factors for development of asthma. The researchers identified that allergy risk factors, including smoking, could be modified through a change of exposure or a change in lifestyle (e.g. quitting smoking after being diagnosed with asthma) [17]. C. Janson reported that both active and passive smoking was named a relative risk factor, which not only promotes asthma development, but also exacerbates its symptoms. Moreover, contact with other allergens, certain nutrients,

and recurring infections of the respiratory tract potentiate this negative impact [12]. N.C. Thomson and M. Spears reported that smokers with asthma are less responsive to asthma treatments, and that their inability to quit smoking calls for an alternative or supplementary therapy. Therefore, one should make every effort to quit smoking [13].

More than a half of respondents were employed full-time, one-sixth of the respondents were either employed part-time, and 5% of respondents were unemployed or were staying at home.

The types of occupations with the highest prevalence of smoking (average 31.7%) were blue-collar jobs. Respondents such as construction workers, craftsmen, miners, industrial workers, drivers (over 50% smokers), as well as self-employed farmers, fishermen (48.2% smokers), and gardeners (48.0% smokers) had the highest prevalence of smoking. These occupations require extensive physical work, under varying weather conditions, which further strain the body, nevertheless this environment seems to promote smoking as a habit. The report released in 2007 by the Estimator study showed that smoking is highly correlated with education level. 30% of people with vocational training only are smokers, 22% of people with high school education are smokers, and only 17% of people with higher education are smokers [23]. The poorest, least educated Poles smoke much more frequently than more affluent, educated ones [18]. Similarly, the CBOS study of 2008 revealed that people with a high school or higher education smoke less frequently than physical labourers, who smoke the most among all occupations. Among skilled and unskilled labourers, half of them are classified as smokers [24].

Tobacco smoke inhalation is the most frequent environmental factor causing mass morbidity and mortality. Every 10 seconds, someone dies from a disease caused by smoking. Each cigarette smoked shortens life expectancy by 5.5 minutes, which translates to a voluntary forfeit of 5 years of life by an average smoker. Middle-aged smokers have lost 2.2 years of their lives, while older smokers have lost an average of 9 years out of their lives. In the last 30 years, a gradual reduction of smoking has been noticed, but the rate of this reduction has decreased in the last several years among smoking men and young adult women. This might be one of the reasons for the higher than expected incidence of respiratory allergic disease.

CONCLUSIONS

- Smoking for a year or longer (v273) was declared by no less than half of the respondents (n = 9,376) in certain research areas, with the mean being 46.8%. Fewer females reported smoking (41.5%) than males (54.3%). On average, more than two-thirds (67.1%) of respondents (n = 4,402) declared smoking in the last month (v275). Of those, 64.6% were male and 69.9% were female. More than a half (57.7%) of the respondents declared (v277) that they had either quit or limited smoking. An average of 62.7% of females and 52.4% of males reported affirmatively to this question. Reducing or quitting smoking resulted in reduced tobacco consumption among the study sample as a whole, but this decrease was small.
- 29.6% of rural women reported smoking, while this percentage was higher among urban women, ranging

from 36.3% in Poznań to 49.5% in Gdańsk. Rural women, however, reported a higher awareness of the harmful effects of smoking. Above all, the highest percentage of smokers was among males in Zamość - 56.1%. This percentage was higher than the overall average in this study.

- Compared to non-smokers, active smokers experienced an increased incidence of allergic diseases, such as wheezing, coughing, cough exacerbations, shortness of breath. This correlation of respiratory tract diseases with active smoking confirms that smoking is a strong risk factor, and one of the major causes of respiratory illnesses.
- Substantial health effects caused by smoking were found for the following symptoms: wheezing, coughing, cough exacerbations, chronic cough, rhinitis, repetitive sneezing, runny or stuffed nose, nose polyps, shortness of breath.
- Almost one-third of respondents reported ETS exposure in their work areas, with an aggregate 3.96 hours of exposure.
- Passive smoking causes both upper and lower respiratory tract symptoms at a statistically significant level for the following: wheezing, coughing, cough exacerbations, chronic cough, shortness of breath, asthma, allergic rhinitis, sneezing, rhinorrhea and nasal congestion.
- Quitting a job because of breathing problems was reported by respondents suffering from asthma, shortness of breath, cough exacerbations, wheezing, rhinitis, repetitive sneezing, runny or stuffed nose, allergic rhinitis, hay fever and chronic cough.
- The types of occupations with the highest prevalence of smoking (average 31.7%) were blue-collar jobs. Respondents such as construction workers, craftsmen, miners, industrial workers, drivers (over 50% smokers), as well as self-employed farmers, fishermen (48.2% smokers), and gardeners (48.0% smokers) had the highest prevalence of smoking.
- The types of occupations with the highest prevalence of smoking were blue-collar jobs. Respondents such as construction workers, craftsmen, miners, industrial workers, drivers, as well as self-employed farmers, fishermen, and gardeners had the highest prevalence of smoking. These occupations require extensive physical work, under varying weather conditions, which further strain the body; nevertheless, this environment seems to promote smoking as a habit.

Tobacco is one of the most dangerous modern health hazards in the history of mankind. Promoting educational programmes, providing designated areas free of tobacco smoke, and offering smokers psychological and pharmacological assistance in the fight with addiction, are instrumental in freeing society of one of civilization's worst plagues. Subsequent amendments to smoking laws have led to full compliance of Polish legislation with the EU directives. Updated regulations enable efficient and consistent control over tobacco products introduced into the Polish market. The following laws were passed:

- A ban on substances that increase nicotine addiction.
- A ban of using names and symbols suggesting that a given tobacco product is less harmful than others.
- A mandate that manufacturers take responsibility to list all additives used.
- A ban on advertising tobacco products according to the EU directive 2003/33.

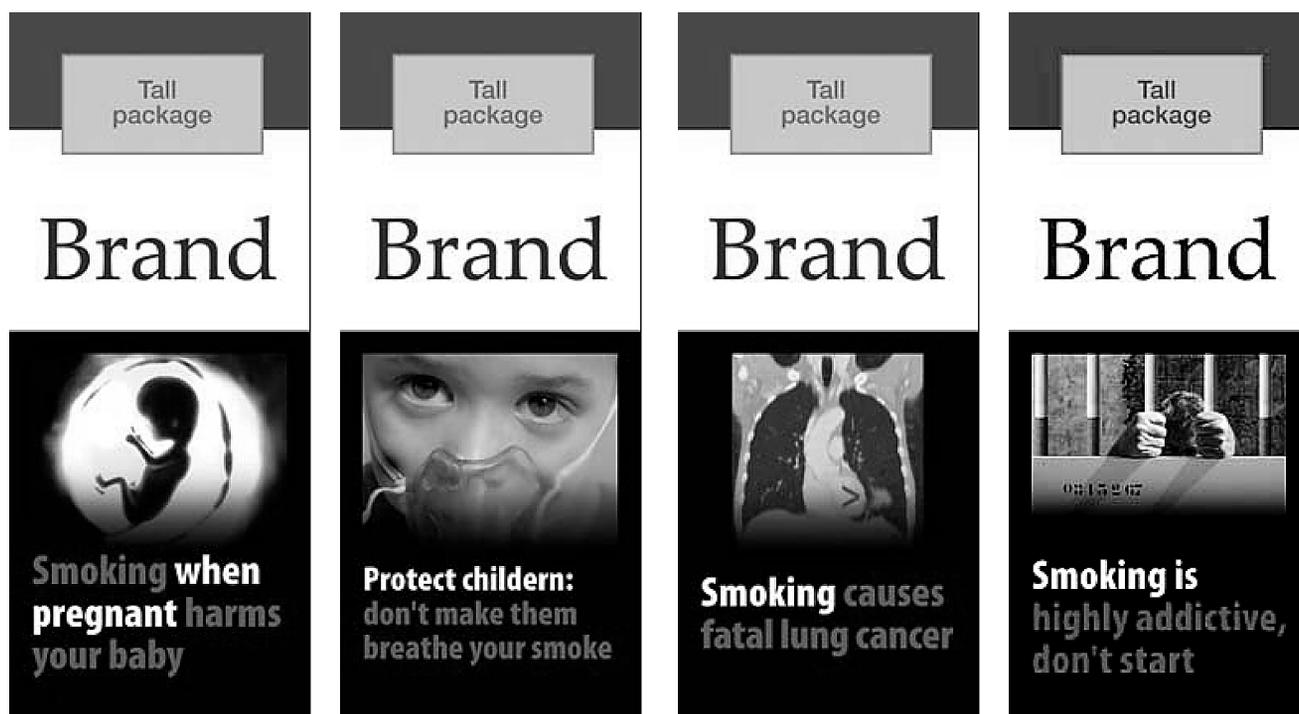


Figure 3. Example of visual warnings placed on cigarette packs in some EU countries

Enacting good health-protecting laws will not change public health without a change in social behaviour. Smoking bans in workplaces and restaurants are still commonly violated because of the indifference of the employers, restaurant managers, and the victims themselves. Habits cannot be changed through legislation that is not universally understood or appreciated. Therefore, education and spreading awareness are extremely important. International No-Tobacco Day, observed annually on 31 May, is part of the Europe Without Tobacco initiative enacted during the WHO convention in Madrid in 1988. This day is aimed at raising awareness of the negative consequences of tobacco smoking. During International Quit-Smoking Day in November, the WHO aims to stress the harmful health, sociological and economic effects of smoking, focusing on different aspects of it each year [35]. Poland takes this opportunity to inform its citizens of the consequences of tobacco smoke, and encourage a healthy lifestyle free of tobacco. Thanks to this project, over 2 million Poles have quit smoking [36]. For many years, the Ministry of Health has initiated and promoted informational, educational, and interventional programmes aimed at reducing the prevalence of smoking and controlling the tobacco-related disease epidemic.

The 2009 WHO report entitled 'The threat of a tobacco-smoking epidemic in Poland' indicated that any actions to prevent such an epidemic should be comprehensive and consistent. The key elements of such a strategy must address both the child and adult population, with a special focus on women, the uneducated, and the poor.

The current priorities in combating tobacco consumption in Poland include:

- A ban of internet tobacco advertisement and free in-the-mail tobacco samples.
- Introduction of visual warnings on cigarette packs.
- Implementation of educational and interventional programmes aimed at protecting children and non-smokers from second-hand smoke at home and in public.

- Constant monitoring and analysis of the status of smoking in Poland through statistical sampling.

The fatal effects of the tobacco epidemic have amounted to 100 million deaths in the twentieth century. Further, the estimated cumulative number of deaths in the twenty-first century will be one billion. If we do not take immediate action, smoking will cause an estimated 10 million deaths annually around the world, beginning in 2020 [35].

The conclusions of many studies support a ban on smoking in public. Furthermore, actions to reduce the impact of ETS, many scientists postulate, can simultaneously reduce the incidence of respiratory tract diseases. Examples of visual warnings placed on cigarette packs in some EU countries is presented in Fig.3. Appropriate legislation is being prepared in Poland.

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