



MAŁGORZATA DŻUGAN, BERNADETA BŁAŻEJ, MONIKA TOMCZYK

Dietary preferences and health status of tobacco smokers in Poland

Abstract

The dietary preferences can enhance or reduce negative consequences of tobacco smoking. Thus, the smoking behavior and dietary habits of 99 patients treated against pulmonary, cardiological and gastroenterological diseases in specialist outpatient clinics in Rzeszów were analyzed. The survey questionnaire examined the relation between tobacco smoking and dietary preferences (quantity and regularity of food intake, and frequency of consumption of several foodstuffs) as well as health effects of smoking. Among the respondents, 48% were currently smoking (smokers), 16% declared themselves as formerly smoking ex-smokers) and 35% did not smoke (non-smokers). The cardiovascular and respiratory health problems were more common in smokers group, but the differences were not significant ($p>0.05$). Smokers' diet was low in healthy kind of food (i.e. vegetables, fruit, dairy product, antioxidative spices) and simultaneously was abundant in meat, strong coffee and alcohol ($p<0.05$) compared to non-smokers. For the ex-smokers greater attention to proper diet composition was observed. Based on the obtained results nutritional guidelines have been formulated to reduce the negative effects of smoking.

Keywords: tobacco smokers, dietary preferences, tobacco-related diseases.

DOI: 10.2478/pjph-2019-0003

INTRODUCTION

Smoking is a phenomenon widespread worldwide and is the most common cause of death among adult populations [1]. Cigarette smoke contains almost 4.000 chemical compounds, including 40 carcinogens. Polycyclic aromatic hydrocarbons, nitrosamines, cadmium, nickel and radioactive isotopes of lead and polonium are the most dangerous carcinogenic compounds of tobacco smoke [2,3]. Health effects of cigarette smoking are observed in the oral cavity and lungs (absorption), but also in all other organs e.g. bladder, pancreas, kidney, reproductive organs [1]. It was tested that smoking increases the risk of coronary heart disease, atherosclerosis, and cancer [3]. Cigarette smoking has significant relation and increases the risk of main histologic types of lung cancer, bladder carcinoma, stomach ulcer, males' impotency and reduces potency in females [1]. Negative effects of tobacco smoke concern not only smokers but also people staying in the smoke environment. There is no safe level of second-hand smoke exposure [1,4]. Even occasional exposure can lead to serious and often fatal diseases, including cardiovascular and respiratory disease as well as lung and other organs cancers [4,5]. Children, newborn infants, and foetuses are especially susceptible to the harms of second-hand smoke exposure and are at increased risk of severe and potentially lifelong health consequences or even death. Thus, lately much more attention is paid to health consequences of so-called "environmental smoking" especially concerning smokers' children [6].

Smoking and diet are among the top 10 risk factors thought to cause the majority of contemporary lifestyle diseases [1]. An inadequate diet and lack of physical activity may intensify the harmful effects of smoking on human health [7]. Less researches show that smoking tobacco also affects the nutrition way, nutritional behavior and shaping the taste [8,9]. Meanwhile, the main goals set in the National Health Program for 2016-2020 are focused on reducing the tobacco addiction and prevention against tobacco-related diseases [10]. However, they completely ignore the need of dietary education of smokers.

The scientific results related to dietary habits of Polish smokers are unique [8,9], but showed a low intake of key nutrients, combined with high consumption of fast food and sedentary lifestyle resulting in overweight [11]. Moreover, the smokers' diet is characterized by high fat intake and the small quantity of fruit, vegetables, milk, and fiber. Smokers consume more alcohol and caffeine but drink much less water than non-smokers [12]. More often they give up breakfast and eat a late supper [9]. However, smokers show remarkable resistance to changing these health-compromising behaviors. Therefore, each intervention that could significantly improve the percentage of people able to successfully change dietary behavior would improve health status of population and save health-care costs [11].

Department of Chemistry and Food Toxicology, Faculty of Biology and Agriculture, University of Rzeszów, Poland

AIM

The aim of the study was to determine the smoking habits and dietary preferences among patients with pulmonary, cardiological and gastroenterological health problems.

MATERIAL AND METHODS

The study was conducted in the form of questionnaire surveys among 99 patients treated in specialist outpatient clinics against pulmonary (n=32), cardiological (n=45) and gastroenterological (n=22) diseases. All patients were from Podkarpackie Voivodship, South-Eastern Poland. Full description of the tested group of patients was shown in Table 1. Respondents were asked to fulfill a survey questionnaire prepared by the author, consisting of 16 questions related to smoking habits, quantity, and regularity of food intake and frequency of consumption of chosen products. The group of current smokers had additional questions about smoking history: duration and the number of cigarettes smoked a day. At the end of the survey, the respondents answered questions on their attitude towards passive smoking and the correctness of the used diet. Physical activity was not included in the study. Respondents received no financial gratification for their effort and the study was anonymous and voluntary.

Collected statistical data was analyzed with Statistica 10 Software (StatSoft, USA). The level of significance was set at $p < 0.05$ and calculated using Pearson's Chi²-test (smoking status, health problem) and Kruskal-Wallis test (food preferences).

RESULTS

Tested population included 48% of patients currently smoking (smokers), 35% of non-smoking (non-smokers), and 16% who declared that they have stopped smoking (ex-smokers) (Table 1). Among smokers and ex-smokers, there were significantly more men than women (Chi²=7.223, $p=0.027$). The smokers' population consist mainly of persons at the age 31-60 years old, with a twice smaller group of the older and younger people. In the ex-smokers group, elder dominated ($p > 0.05$). Exposure to tobacco smoke at the workplace was the highest in the smokers group (Chi²=13.56, $p=0.001$).

Moreover, about half of the smokers smoke cigarettes at home, exposing their families to passive smoking (Table 1). The majority of tested smokers have been smoking above 10 years (83%), only 11% were persons with less than 5 years of smoking experience. The number of cigarettes smoked per day ranged from 10 (15%) to 20 (54%). More than 20 cigarettes per day were used by 23% of smokers, whereas 8% were casual smokers (data not shown).

The predominant part of respondents (45%) were patients treated for a chronic cardiovascular disease, respiratory diseases were treated by 37%, while gastrointestinal diseases were treated by 22% of patients (Table 1). However, some patients have complex health problems (5), usually cardio-respiratory ones (4). The prevalence of cardiovascular disease among smokers and ex-smokers was higher than in non-smokers but this difference was insignificant (Chi²=1.509, $p=0.470$). A similar relationship was observed for respiratory diseases (Chi²=1.619, $p=0.445$). Meanwhile, gastrointestinal diseases are less common among smokers and ex-smokers than in non-smokers (Chi²=1.619, $p=0.445$).

The analysis of dietary habits showed no statistically significant differences in eating behavior of respondent groups ($p > 0.05$). However, in the smokers group, less number of meals, missing breakfasts, and irregular eating behavior were observed (Table 2). Moreover, significant differences in daily intake of some foodstuff between smokers and non-smokers were found (Table 3). Smokers prefer white bread whereas non-smokers use a whole wheat bread ($p < 0.05$). The consumption of other fiber sources, i.e. cereal products and legumes, was the highest in non-smokers, medium in ex-smokers and the lowest in smokers groups, but this tendency was not significant (Table 3). The protein intake was lower in smokers regarding both cheese and fermented milk products with probiotic properties. Similarly, the daily intake of fruits and vegetables was significantly lower in smokers as compared to non-smokers ($p < 0.01$). Smokers also rarely use spices and supplements. They drink less water, fruit juices and green tea, replacing them with strong coffee ($p < 0.01$). At the same time, smokers' diet was abundant in meat and fast-food. They drink

TABLE 1. Cigarette smoking status of tested patients group, by characteristics.

Characteristic	n	Frequency of smoking		
		Smokers, %	Ex-smokers, %	Non-smokers, %
Total	99	48	16	35
Sex				
Male	52	62.5	62.5	34.3
Female	47	37.5	37.5	65.7
Age, years old				
>60	20	12.5	28.6	25.0
60-46	29	35.4	31.4	18.8
45-31	28	33.3	25.7	25.0
30-18	22	18.8	14.3	31.3
Exposure to smoke				
Workplace	9	14.6	0.0	5.7
Home	34	51.4	25.0	14.3
Health problem ^a				
Cardiovascular	45	50.0	50.0	37.1
Respiratory	37	37.5	50.0	31.4
Gastrointestinal	22	18.8	12.5	31.4

^a Respondents have the option to choose more than one answer

TABLE 2. Eating behavior of patients by cigarette smoking status.

Behavior	n	Smoking status			p-value
		Smokers, %	Ex-smokers, %	Non-smokers, %	
Meals per day					
>5	16	12.5	17.1	18.8	H=3.166, $p=0.205$
3-4	61	60.4	74.3	56.2	
1-2	22	27.1	8.6	25.0	
Regular eating ^a					
Breakfast	61	54.2	68.8	68.6	Chi ² =2.187, $p=0.335$
Lunch	42	33.3	43.8	54.3	Chi ² =3.652, $p=0.161$
Dinner	32	25.0	43.8	37.1	Chi ² =3.896, $p=0.143$
Irregular	21	29.2	18.8	11.4	Chi ² =3.88, $p=0.144$

^a Respondents have the option to choose more than one answer

alcohol at least once a week ($p < 0.05$). For the ex-smokers, adjusted diet based on enhanced vegetables ($p < 0.01$), green tea and spices consumption was observed. In this group, the highest daily intake of mineral water and reduced sweets eating were observed, as a beneficial diet modification (Table 3).

Finally, the respondents' attitudes towards passive smoking (Figure 1) and self-esteem of used diet (Figure 2) were studied. Only 21.1% of smokers are convinced that passive smoking is dangerous for non-smokers. This may be the reason why they expose their close family to the smoking cigarette without considering the negative impact of tobacco smoke on their health.

On the other hand, the percentage of smokers (22.9%) who considered their own diet as correct was significantly lower ($p < 0.05$) as compared to ex-smokers (56.3%) and non-smokers (62.9%). It can be due to the fact that smokers did not have sufficient knowledge about diet correctness and/or have never thought about their diet style.

DISCUSSION

Smoking is a major risk factor in the development of preventable disease which may be due to a poorer diet and the reduced nutrient intake of smokers [3]. Our objective was to compare and evaluate the reported food preferences between smokers, ex-smokers, and non-smokers among patients of specialist outpatient clinics. Due to the fact that cancer, cardiovascular diseases, and chronic pulmonary disease are considered

to be the main problems associated with cigarette smoking [1], the present study covered the groups of patients treated against chronic cardiovascular, respiratory and gastrointestinal diseases. We hypothesized that improper dietary habits of smokers can aggravate tobacco-related diseases.

The biological effects of tobacco smoke and its active components are strongly correlated with the distribution of tobacco diseases throughout the world [6,13]. Insignificant differences in the frequency of occurrence of cardiovascular and respiratory diseases were found in the smokers and ex-smokers groups as compared to never-smoking. Our findings confirmed that there were important dietary differences between smokers and non-smokers, all tending toward unhealthy patterns. It has been found that smokers, compared with non-smokers, eat fewer vegetables, fruit, dairy product, antioxidative spices, and their diet was rich in unhealthy food.

Similarly, in many foreign studies examining patterns of health behavior covariation in adolescents, they have related smoking behavior to irregular meal patterns, greater intakes of soft drinks, and lower intakes of fruits, vegetables, and dairy foods [7,14,15]. Moreover, it has been shown that the composition of the diet of smokers was different from the diets of never-smokers, while ex-smokers had intermediate values [14-16]. Such few observations concern also smokers in Poland [9,17]. The authors agree that Polish smokers' diet is irregular and low in basic nutrients (protein and fiber) as compared to the non-smoking population. Moreover, some studies

TABLE 3. Daily dietary intake of some foodstuff among respondents by cigarette smoking status: smokers (S), ex-smokers (ex-S) and non-smokers (non-S).

Frequency of food intake ^b	Smoking status			Statistics		
	S	ex-S	non-S	H	P	Differences
White bread	3.46	3.25	3.09	6.189	0.045*	S vs. non-S
Whole wheat bread	2.17	2.50	2.71	6.421	0.040*	S vs. non-S
Cereal products (flakes, groats)	1.42	1.75	1.94	5.724	0.057	
Legumes	1.63	1.63	1.74	0.570	0.752	
Vegetables	2.92	3.50	3.25	15.599	0.000**	S vs. non-S, S vs. ex-S
Fruit	2.79	3.13	3.34	12.482	0.002**	S vs. non-S
Cured meat	2.54	2.19	2.00	7.673	0.022*	S vs. non-S
Fish	1.69	1.75	2.00	5.107	0.078	
Eggs	2.44	2.69	2.60	1.458	0.482	
Fermented milk products	2.10	2.25	2.57	6.121	0.047*	S vs. non-S
Cheese	2.13	2.25	2.63	9.977	0.007**	S vs. non-S
Mineral water	2.75	3.37	3.25	10.010	0.007**	S vs. non-S
Fruit/vegetable juices	2.17	2.13	2.38	10.758	0.005**	S vs. non-S
Green tea	1.42	1.44	2.14	13.507	0.001**	S vs. non-S, ex-S vs. non-S
Spices	1.81	2.40	2.42	5.874	0.049	S vs. non-S, S vs. Ex-S
Supplements	1.40	1.80	2.22	10.723	0.012*	S vs. non-S
Strong coffee	3.46	3.38	2.60	9.369	0.009**	S vs. non-S
Alcohol	1.98	1.69	1.40	12.480	0.002**	S vs. non-S
Sweets	2.38	2.13	2.57	3.924	0.141	
Fast-food	1.71	1.44	1.37	3.448	0.178	

^b measured in 4th degree scale: 1-rarely, 2-once a week, 3- three times per week, 4-every day
* $p > 0.05$, ** $p > 0.01$

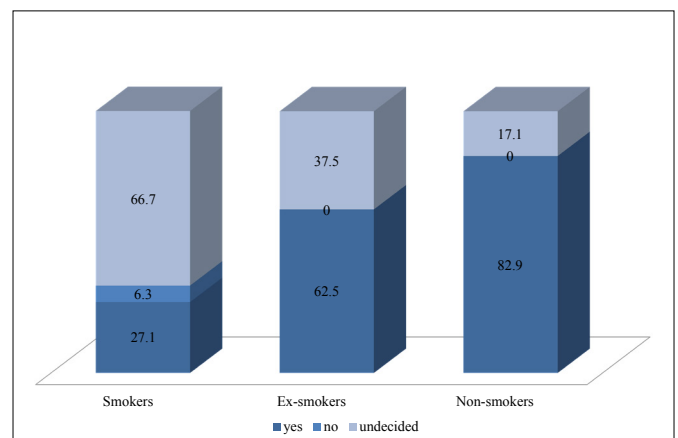


FIGURE 1. Awareness of the risks associated with passive smoking by cigarette smoking status, %.

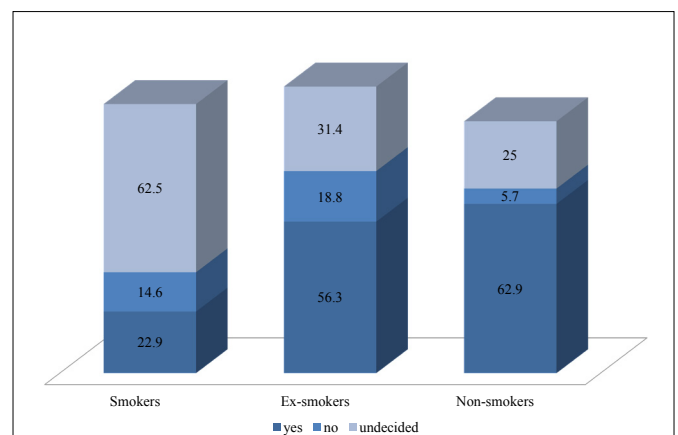


FIGURE 2. Awareness of the correctness of the diet by cigarette smoking status, %.

have found a lower consumption of vitamins A, C, and D, while others have determined lower consumption of dietary fiber among smokers compared to non-smokers [16,18]. Fruit intake is very important for smokers, because of the effect of smoking on the free-radical formation, smokers have higher metabolic requirements for vitamin C (a strong antioxidant) and the negative health impact of poor or marginal diets is greater for smokers than for non-smokers [18,19]. As reported earlier [20], men who smoked more than 20 cigarettes per day ate almost 60% less fruit than men who never smoked. Authors also observed a significant but less dramatic reduction of fruit consumption in women smokers compared with non-smoking women. The similar trends found Śmiechowska et al. [9] for Polish smokers employed in an educational institution who eat fruits less than once a week and only 22% of them include vegetables to their daily diet.

It is also known that smokers consume more unhealthy foodstuffs as sweets, strong coffee and alcoholic beverages as compared to non-smokers. Analysis of beverage consumption showed that smokers consume much more coffee than non-smokers [9]. Namely, 64% of smokers were drinking 3-5 glasses of coffee every day, whereas such consumption was observed for 17% of the non-smoking group. Moreover, a high statistically significant association between smoking status and hazardous intake of alcohol have been reported [21]. Smokers tend to be greater consumers of alcoholic beverages, therefore, may replace calories and nutrients from food sources with those from drinks. Similarly, Polish smokers consumed more wine and vodka and at the same time drink less water [9]. While cited results concerned a specific group of teachers and auxiliary staff in the school [9], the similar dietary habits were observed in our study with the use of an independently selected group of smokers with serious health problems.

All presented data show that Polish smokers, who are known to be at increased risk for several cancers, have a low intake of nutrients and foods associated with cancer prevention. In this case, the most important seems to be a regular and high intake of fruits and vegetables, especially cruciferous vegetables which have protective effects not only against lung cancer but also against other kinds of cancers [22]. This kind of food with high antioxidant activity also prevent smokers from oxidative stress induced by tobacco smoking [20,21].

Meanwhile, smoking cessation is recommended as effective action against cancer prevention, particularly with respect to lung cancer, whereas an additional risk from low dietary intake of critical nutrients is completely ignored. Moreover, our findings showed that smokers wrongly evaluate their diet and they are not to be convinced about the harm caused by tobacco smoke in the case of "passive smoking". Therefore, active dietary education of smokers is needed. The basic role of physicians and dietetics should be to recommend smokers how to increase their intake of fruits, vegetables, and high fiber grains in order to reduce negative consequences of smoking. Based on presented results, specific dietary recommendations for smokers can be formulated.

CONCLUSIONS

Based on a case study where the surveys among patients of specialist outpatient clinics in Rzeszów were carried out, the differences between smokers' and non-smokers' dietary preferences were confirmed. Smokers less frequently reported correct eating habits and more often ate irregularly. Among smokers, the consumption of fruit, vegetables, and herbal spices providing strong antioxidant activity was inadequate. Smokers more often suffered from cardiovascular and respiratory diseases as compared to never-smokers, however, the observed tendency was insignificant. Meanwhile, smokers are not aware of their nutritional errors, as well as they do not estimate the risk associated with exposing their families to smoke. To conclude, general recommendation for tobacco-smokers to balance their diet concern the increase of fruit and vegetables, milk products and spices consumption. At the same time, they should replace strong coffee with mineral water, green tea or fruit juices, and reduce sweet and alcoholic beverages intake.

Acknowledgment

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors declare that they have no conflict of interest.

REFERENCES

1. WHO report on the global tobacco epidemic. Monitoring tobacco use and prevention policies. World Health Organization, Geneva, 2017. License: CC BY-NC-SA 3.0 IGO.
2. Dżugan M, Juszczyk M. Rakotwórcze substancje w dymie tytoniowym. *Pol J Publ Health*. 2006;116:627-30.
3. Flouris AD, Faght BE, Klentrou P. Cardiovascular disease risk in adolescent smokers: evidence of a "smoker lifestyle". *J Child Health Care* 2008;12:221-31.
4. Scientific Committee on Tobacco and Health (SCOTH). Secondhand smoke: review of evidence since 1998. London: Department of Health; 2004. p. 1-28. (http://www.smokefreeengland.co.uk/files/scoth_secondhandsmoke.pdf, accessed 25 September 2017)
5. Szczygieł L. Uzależnienie od tytoniu. *Gazeta Farmaceutyczna*. 2008;4:42-4.
6. Wierzejska R, Jarosz M. Palenie tytoniu – problem zdrowotny i społeczny. *Żyw Człow Metab*. 2010;37(2):129-38.
7. Subar AF, Harlan LC, Mattson ME. Food and nutrient intake differences between smokers and non-smokers in the US. *AJPH*. 1990;80:1323-9.
8. Babicz-Zielińska E, Nazarewicz R, Polańska A. Zwyczaje żywieniowe osób palących papierosy. *Żyw Człow Metab*. 2003;30(1-2): 53-6.
9. Śmiechowska M. Effect of tobacco smoking on the choice of mode of nutrition and dietary behaviours – Preliminary study. *Med Og Nauk Zdr*. 2015;21(1):107-11.
10. Rozporządzenie Rady Ministrów z dnia 4 sierpnia 2016 r. w sprawie Narodowego Programu Zdrowia na lata 2016–2020. *Dz. U. poz.* 1492.
11. Williams GC, Minicucci DS, Kouides RW, et al. Self-determination, smoking, diet and health. *Health Educ Res* 2002;17:512-21. <https://doi.org/10.1093/her/17.5.512>
12. Watson JM, Scarinci IC, Klesges RC, et al. Relationships among smoking status, ethnicity, socioeconomic indicators, and lifestyle variables in a biracial sample of women. *Prev Med*. 2003;37:138-47.
13. Centers for disease control and prevention how tobacco smoke causes disease: the biology and behavioral basis for smoking-attributable disease. A report of the surgeon general. National center for chronic disease prevention and health promotion (US); Office on Smoking and Health (US) 2010. <https://www.ncbi.nlm.nih.gov/books/NBK53017/> (assessed 16.11.2017)
14. Semeniuk W. Zwyczaje żywieniowe ludzi palących. *Pol J Hum Nutr*. 2007;3-4:896-902.
15. Raatz SK, Jahns L, Johnson LK, et al. Smokers report lower intake of key nutrients than nonsmokers, yet both fall short of meeting recommended intakes. *Nutr Res*. 2017;45:30-7.
16. Dyer AR, Elliott P, Stamler J, et al. Dietary intake in male and female smokers, ex-smokers, and never smokers: the INTERMAP study. *J Hum Hypertens*. 2003;17:641-54.

17. Sygnowska E, Waskiewicz A. Sposób żywienia a postawy wobec palenia tytoniu – badanie Pol-Monica Bis. *Żyw Człow Metab* 2006;33(1):3-17.
18. Eiserich JP, van der Vliet A, Handelman G, et al. Dietary antioxidants and cigarette smoke-induced biomolecular damage: a complex interaction. *The American Society for Clinical Nutrition*. 1995;62:1490S-1500S.
19. Jain A, Agrawal BK, Varma M, Jadhav AA. Antioxidant status and smoking habits: relationship with diet. *Singapore Med J*. 2009;50:624-7.
20. Zondervan MC, Ocke HA, Smit JC, Seidell. Do dietary supplementary intakes of antioxidants differ with smoking status? *Int J Epidemiol*. 1996;25:70-9.
21. Lupton JR, Blumberg JB, L'Abbe M, et al. Nutrient reference value: non-communicable disease endpoints--a conference report. *Eur J Nutr*. 2016;55:S1-10.
22. Higdon JV, Delage B, Williams DE, Dashwood RH. Cruciferous vegetables and human cancer risk: epidemiologic evidence and mechanistic basis. *Pharmacol Res*. 2007;55:224-36.

Corresponding author

Dr hab. Małgorzata Dżugan
Department of Chemistry and Food Toxicology, Faculty of Biology and Agriculture,
University of Rzeszów
1a/129 Ćwiklińskiej St., 35-601 Rzeszów
E-mail: mdzugan@ur.edu.pl