Cardiovascular disease risk factors in the Lubelskie Voivodeship in 2008-2018 – part I: smoking

Czynniki ryzyka chorób układu krążenia na terenie województwa lubelskiego w latach 2008-2018 – część I: palenie tytoniu

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Abstract: *Background:* Smoking is one of the most common cardiovascular risk factors. It is responsible for 7 million deaths annually in the world. Another 1.2 million people die from passive smoking. Nicotinism causes a chronic inflammatory process, oxidative stress, and it also works by increasing adrenergic arousal. The Cardiovascular Diseases Prevention Program implemented by Primary Healthcare Clinics is designed to assess the risk factors for cardiovascular events in patients. This provides an opportunity for an early response and appropriate action. *Methods:* A retrospective analysis of data obtained by the National Health Fund as part of the implementation of 86,485 preventive cards of the Cardiovascular Diseases Prevention Program in the Lubelskie Voivodeship in 2008-2018 was carried out. The analyzes were performed using the IBM SPSS Statistics for Windows, version 25 program. The chi-square test and the Pearson linear correlation between the quantitative features were used to test the relationship between the two qualitative features. Significant predictors of a risk factor for cardiovascular disease were determined using multivariate logistic regression. The significance level was assumed to be $\alpha = 0.05$ for two-tailed tests. *Results:* Tobacco smoking was declared by 26.5% of all respondents. It was significantly more often declared by men. The percentage of smokers increased with age–the highest was obtained for the group of 55-year-olds. Smoking cigarettes was significantly more often reported by people with primary education (44%), manual workers (33%) and retirees / pensioners (35%). Smoking tobacco escalated the risk of being diagnosed with arterial hypertension by 16.5%. It significantly influenced the risk of diabetes–even by 33.9%. It raised the risk of hypercholesterolaemia by 17.1% compared to never-smokers as well. *Conclusions:* The prevalence of nicotinism is alarmingly high. The effective implementation of the Cardiovascular Diseases Prevention Program provides an opportunity to educate on a large scale and identify patients at high risk of a cardiovascular event. Assessing the risk of death on the SCORE scale can motivate patients to change their lifestyle and make them aware of the impact of smoking on increasing this risk.
Keywords: cardiovascular diseases, risk factors, tobacco smoking

Abstrakt: *Wstęp:* Palenie tytoniu jest jednym z najbardziej rozpowszechnionych czynników ryzyka sercowo-naczyniowego. Na świecie odpowiada za 7 milionów zgonów rocznie. Kolejne 1,2 miliona osób umiera z powodu biernego palenia tytoniu. Nikotynizm wywołuje przewlekły proces zapalny, stres oksydacyjny, a także działa przez wzrost pobudzenia adrenergicznego. Program Profilaktyki Chorób Układu Krążenia realizowany przez Poradnie POZ ma za zadanie ocenę czynników ryzyka incydentów sercowo-naczyniowych u pacjentów. Daje to okazję do odpowiednio wczesnej reakcji i podjęcia stosownych działań. *Metoda:* Przeprowadzono analizę retrospektywną danych pozyskanych przez NFZ w ramach realizacji 86 485 kart profilaktycznych Programu „CHUK" na terenie województwa lubelskiego w latach 2008-2018. Analizy wykonano przy pomocy programu IBM SPSS Statistics for Windows, version 25. Do zbadania związku między dwiema cechami jakościowymi wykorzystano test chi-kwadrat oraz korelację liniową Pearsona między cechami ilościowymi. Istotne predyktory czynnika ryzyka chorób sercowo-naczyniowych określono za pomocą wieloczynnikowej regresji logistycznej. Za poziom istotności przyjęto $\alpha = 0.05$ dla testów dwustronnych. *Wyniki:* Palenie tytoniu zadeklarowało 26,5% wszystkich badanych. Istotnie częściej było ono deklarowane przez mężczyzn. Odsetek palących rośnie waz z wiekiem–najwyższy uzyskano dla grupy 55-latków. Palenie papierosów istotnie częściej podawały osoby z wykształceniem podstawowym (44%) oraz pracownicy fizyczni (33%) i emeryci/renciści (35%). Palenie tytoniu o 16,5% zwiększa ryzyko rozpoznania nadciśnienia tętniczego krwi. Istotnie wpływa na ryzyko wystąpienia cukrzycy – nawet o 33,9%. Zwiększa również ryzyko hipercholesterolemii o 17,1% w stosunku do nigdy niepalących. *Wnioski:* Rozpowszechnienie nikotynizmu jest niepokojąco wysokie. Efektywne przeprowadzanie programu CHUK daje sposobność, aby na szeroką skalę prowadzić edukację i identyfikować pacjentów wysoce zagrożonych incydentem sercowo-naczyniowym. Ocena ryzyka zgonu w skali SCORE może zmotywować pacjenta do zmian stylu życia oraz uświadomić wpływ palenia papierosów na zwiększenie tego ryzyka.
Słowa kluczowe: choroby układu krążenia, czynniki ryzyka, palenie tytoniu

Introduction

Smoking is the leading cause of mortality in the world. Globally, it is responsible for 7 million deaths each year, and a further 1.2 million people die from passive smoking (WHO, 2020). The use of tobacco is a known risk factor for many diseases, among them the leading group is lung cancer, but also urinary tract,

oral cavity, pharynx and esophagus, larynx, pancreas and stomach cancers. Nicotinism also contributes to the development of chronic obstructive pulmonary disease and cardiovascular diseases (Chang, Corey, Rostron, Apelberg, 2015).

It has been proven that smoking is a factor in the development of atherosclerosis through its influence on chronic inflammation, oxidative stress and an increase in adrenergic arousal and related disorders of vasoconstriction and vasodilation. It also causes a chronic prothrombotic state (Ross, 1999). Smoking affects the structure of atherosclerotic plaque–it is independently related to the presence of lipid-rich plaque (Kumagai, Amano, Takashima, Waseda, Kurita, Ando, Maeda, Ito, Ishii, Hayashi, Yoshikawa, Suzuki, Tanaka, Matsubara, Murohara, 2015). This type of plaque is described as less stable (Shah, 2015) and therefore is associated with a higher risk of cardiovascular events (Amano, Matsubara, Uetani, Kato, Kato, Yoshida, Harada, Kumagai, Kunimura, Shinbo, Kitagawa, Ishii, Murohara, 2011).

The impact of e-cigarette use on cardiovascular risk remains inconclusive. The first e-cigarettes appeared in 2007, therefore the perspective of their use in epidemiological and research terms is relatively short. It has been proven that nicotine from e-cigarettes is delivered more slowly to the body and reaches lower maximum levels (St Helen, Havel, Dempsey, Jacob, Benowitz, 2016). However, propylene glycol, which is the main component of fluids used in e-cigarettes, may cause irritation of the respiratory tract and probably contributes to the development of chronic inflammatory changes (Benowitz, Burbank, 2016).

The Cardiovascular Diseases Prevention Program implemented by Primary Healthcare Clinics is an activity fulfilling the assumptions of primary and secondary prevention. A prophylactic visit is an opportunity to implement medical education. A family doctor tries to control the risk factors, and on the basis of the screening tests performed, identifies patients in the early stages of the disease and starts treatment. Until July 1, 2022, the CHUK program was addressed to people on the list of Primary Healthcare physicians who were 35, 40, 45, 50, and 55 years of age in a given year, who had not previously been diagnosed with cardiovascular diseases and the had not participated in the program in the last 5 years (Minister Zdrowia, 2019).

Until the end of 2021, the European Society of Cardiology (ESC) recommended the use of SCORE cards for the assessment of cardiovascular risk (Conroy, Pyörälä, Fitzgerald, Sans, Menotti, De Backer, De Bacquer, Ducimetière, Jousilahti, Keil, Njølstad, Oganov, Thomsen, Tunstall-Pedoe, Tverdal, Wedel, Whincup, Wilhelmsen, Graham, SCORE project group, 2003). The Polish Society of Cardiology recommends the use of the SCORE card, which was subject to national recalibration–Pol-SCORE 2015 (Zdrojewski, Jankowski, Bandosz, Bartuś, Chwojnicki, Drygas, Gaciong, Hoffman, Kalarus, Kaźmierczak, Kopeć, Mamcarz, Opolski, Pająk, Piotrowicz, Podolec, Rutkowski, Rynkiewicz, Siwińska, Stępińska, Windak, Wojtyniak, 2015). The SCORE card is used to determine the risk of death from cardiovascular causes within 10 years and includes the assessment of gender, smoking, age, systolic blood pressure and total cholesterol level (Conroy et al, 2003). When a patient achieves a SCORE of <1%, he is classified as low risk, ≥1% and <5% moderate, ≥5% and <10% high, and ≥10% very high risk (Conroy et al, 2003).

1. Aim of the study

The main aim of the study was to assess the prevalence of smoking as a risk factor for cardiovascular diseases in the studied population.

2. Material and methods

A retrospective analysis of the data obtained by the National Health Fund as part of the Cardiovascular Diseases Prevention Program (CHUK) in the Lublin Province in 2008-2018 was carried out. The study population consisted of patients who met the criteria and were included in the Cardiovascular Disease Prevention Program. The sociodemographic variables (age, sex, place of residence, occupation, education), anthropometric variables (height, weight, BMI, arm circumference,

waist circumference), family history (occurrence of a father's heart attack and stroke before the age of 55, for mother age of 60) were assessed. The form helped to obtain data on current and past smoking physical activity over 30 minutes a day during the week, blood pressure, heart rate, laboratory test results (total cholesterol , LDL and HDL cholesterol, triglycerides, fasting glucose). The analyzes were performed using IBM SPSS Statistics for Windows, version 25 (IBM Corp., Armonk, N.Y., USA). The compliance with the normal distribution of a given feature was assessed using the Shapiro-Wilk test. The distribution of qualitative variables was described by giving absolute and relative frequencies. The chi-square test was used to test the relationship between the two qualitative features, and the Pearson linear correlation between the quantitative features. Significant predictors of cardiovascular disease risk factor were determined using multivariate logistic regression. The results of the analysis are presented as the odds ratio (OR) together with the 95% confidence interval (95% CI). The significance level was assumed to be $\alpha = 0.05$ for two-tailed tests.

3. Results

Data on 86,485 preventive visits were analyzed. The study population was dominated by women (61.3%), and men constituted 38.7% of the population. The highest reporting rate was observed in the 35 and 40-year-old age group–they constituted 48.6% of all respondents. 45-year-olds accounted for 19.8% of cases, 50-year-olds–17.8%, and 55-year-olds–14.3%. People with secondary education prevailed (36.7%), while nearly every fourth respondent had higher education. Blue-collar workers accounted for 31.4% of the respondents, white –collar workers–27.5%, farmers–19.7%, and 4.5% was retired/disability pensioner.

Smoking was declared by 26.5% of all respondents. The percentage of smokers in the past was lower (18.9%). Tobacco use was significantly more frequent among men (currently–35.3%, in the

past–24%) than among women (currently 21%, in the past–15.8%). The percentage of people smoking cigarettes increased with age. In the group of patients aged 55, almost every third person used tobacco products (Tab. No. 1).

Smoking cigarettes was significantly more often declared by people with a lower level of education (Tab. No. 2) and manual workers and retirees / pensioners (Tab. No. 3).

There was a relationship between smoking and the prevalence of hypertension in the study population observed. Respondents who had never smoked, had a 16.5% lower chance of being diagnosed with hypertension compared to current smokers (95% CI: 0.795- 0.878, p <0.001). Smoking significantly influenced the chance of developing diabetes (glycaemia ≥126 mg / dl). The odds increased by 32.5% for current smokers compared to previous smokers (95% CI: 0.567-0.803, p <0.001) and for never smokers by 33.9% (95% CI: 0.571-0.766, p <0.001). Moreover, significant influence of smoking on the lipid profile was observed. In current smokers, it increased the risk of hypercholesterolaemia (T-Chol concentration ≥190 mg / dl) by 17.1% compared to non-smokers (95% CI: 0.801-0.859, p <0.001). The chances of obtaining an LDL ≥115 mg / dl result was 10.8% higher in current smokers than in non-smokers (95% CI: 0.862-0.923, p <0.001).

4. Discussion

Smoking is a particularly widespread cardiovascular risk factor in low- and middle-income countries. The WHO estimates that 1.3 billion people worldwide use tobacco (WHO, 2020). There is also a high rate of smoking in Europe. According to the Special Survey "Eurobarometer 458" of 2017, on average, every fourth citizen of the European Union used tobacco products (European Commission, 2017). Smoking in the region of Central and Eastern Europe was more frequent than in the entire continent (WHO, 2012), and Poland was ranked eighth among all European Union countries in terms of the frequency of smoking (European Commission, 2017).

Table 1. Smoking by age

Age [years]	35		40		45		50		55	
Smoking	n	%	n	%	n	%	n	%	n	%
currently	5 301	23,8%	4 787	24,2%	4 575	26,8%	4 443	29,5%	3 850	31,1%
In the past	3 772	17,0%	3 369	17,1%	3 175	18,6%	3 189	21,2%	2 881	23,3%
never	13 161	59,2%	11 600	58,7%	9 333	54,6%	7 410	49,3%	5 639	45,6%
p<0,001										

Table 2. Smoking by education

Education	primary		vocational		secondary		higher	
Smoking	n	%	n	%	n	%	n	%
currently	2 825	44,3%	8 826	35,1%	7 807	25,2%	3 033	13,8%
in the past	1 061	16,6%	5 011	19,9%	6 112	19,7%	3 906	17,8%
never	2 487	39,0%	11 293	44,9%	17 095	55,1%	14 994	68,4%
p<0,001								

Tabela 3. Smoking by occupation

Occupation	blue-collar worker		white-collar worker		farmer		retired/pensioner		other	
Smoking	n	%	n	%	n	%	n	%	n	%
currently	8 665	33,0%	3 666	16,0%	4 339	26,3%	1 383	34,8%	4 073	29,2%
in the past	5 585	21,3%	4 177	18,2%	2 640	16,0%	809	20,4%	2 723	19,6%
never	11 976	45,7%	15 123	65,8%	9 503	57,7%	1 777	44,8%	7 129	51,2%
p<0,001										

In the analyzed material, the prevalence of tobacco smoking was 26.5%, with the males predominating (M: 35.3% vs F: 21.0%, p<0,001). The described frequency of smoking is comparable to the available data on the problem of smoking in Poland, which estimates the incidence of smoking at 25.8-31.5% among men and 14.3-20.9% among women (Polakowska, Kaleta, Piotrowski, Topór-Mądry, Puch-Walczak, Niklas, Bielecki, Kozakiewicz, Pająk, Tykarski, Zdrojewski, Drygas, 2017; Zdrojewski, Rutkowski, Bandosz, Gaciong, Solnica, Drygas, Wojtyniak, Stokwiszewski, Pencina, Wołkiewicz, Piwonski, Jędrzejczyk, Grodzicki, Wyrzykowski, 2015; Podolec, Kopeć, 2006; Sulicka, J., Fornal, M., Gryglewska, B., Wizner, B., Grodzicki, 2006; Pinkas, Kaleta, Zgliczyński, Lusawa, Wrześniewska-Wal,

Wierzba, Gujski, Jankowski, 2019). The above results refer to the nationwide population, and the data collected in my study only for the Lubelskie Voivodeship, which may affect the differences in the results obtained. In the WOBASZ study, the percentage of regular tobacco smokers for the Lubelskie Voivodeship was similar to the average for the entire country and amounted to 42% for men and 23% for women (Polakowska, Piotrowski, Tykarski, Drygas, Wyrzykowski, Pajak, Kozakiewicz, Rywik, 2005). It has been observed in many countries that many people have tried or given up smoking during the COVID-19 pandemic (Carreras, Lugo, Stival, Amerio, Odone, Pacifici, Gallus, Gorini, 2021; Kayhan Tetik, Gedik Tekinemre, Taş, 2021; Di Renzo, Gualtieri, Pivari, Soldati, Attinà, Cinelli, Leggeri,

Caparello, Barrea, Scerbo, Esposito, De Lorenzo, 2020; Jackson, Garnett, Shahab, Oldham, Brown, 2021). The available literature lacks up-to-date data on the prevalence of smoking in Poland, therefore it seems important to reassess the habits of Poles.

A higher percentage of smoking men was observed in the WOBASZ study (39%) and in the project assessing cardiovascular risk factors of Primary Health Care patients (38.7%) (Polakowska et al., 2021; Sulicka, et al., 2006), and the WOBASZ (23.8%) and NATPOL2011 (27.5%) studies described higher percentage tobacco users among women (Podolec, Kopeć, 2006; Sulicka, et al., 2006). A lower percentage of people smoking tobacco products was obtained in the study conducted in representative Polish population–25.8% for men and 19.2% for women (Pinkas et al., 2019) and document prepared by the National Institute of Public Health–National Institute of Hygiene assessing smoking prevalence on 23,1% in men and 14.9% in women (Poznańska, Rabczenko, Wojtyniak, 2020).

In the author's own material, the age of starting tobacco smoking was calculated on the basis of the difference between the current age and the number of years of smoking, and it was on average 25.48 years. According to various estimates, for Poland it is much less–from 18.4 to 20.13 years (Polakowska et al., 2017). Similarly, in the international GATS study, the age of tobacco initiation recorded in the 16 analyzed countries was even lower–from 16 to 20 years for daily smokers (Giovino, Mirza, Samet, Gupta, Jarvis, Bhala, Peto, Zatonski, Hsia, Morton, Palipudi, Asma, GATS Collaborative Group, 2012). The described difference in relation to the own results may indicate that the number of years of smoking is underestimated by the respondents participating in the CHUK preventive study.

According to the obtained results, the average number of cigarettes smoked daily was 14.84 cigarettes and did not differ significantly from the data obtained by Pinkas group (15.0 items) (Pinkas, et al., 2019) and the authors of the POLSCREEN study (16 items for men, 13 items for women (Podolec, Kopeć, 2006). However, in the WOBASZ and WOBASZ II study for men it was 20 and 15, respectively, and for women–13 and 10 (Polakowska et al., 2017).

Moreover, the "Lost in Italy" study examining the impact of lockdown due to the COVID-19 pandemic on the habit of smoking among Italians indicates that cigarette consumption increased by 9.1%. This trend was the most relevant in the groups of people with deteriorated quality of life, reduced duration of sleep, with increased level of anxiety and depressive symptoms (Carreras et al., 2021). Due to the above observations, it seems justified to conduct current socio-demographic research in Poland with an attempt to estimate analogous changes.

An ambiguous phenomenon that has not been assessed Cardiovascular Diseases Prevention Program is the use of e-cigarettes. A study by the National Institute of Public Health–National Institute of Hygiene indicates that in 2020 10.8% of men and 7.1% of women used only electronic tobacco products every day, and there was a clear group of respondents who regularly use traditional cigarettes and electronic products interchangeably. In younger age groups, the percentage of e-cigarette use was even higher–for the 30-39 age group, it was 4.3% of those who used only electronic tobacco devices, and 5.8% of those who used both types of tobacco products. Summing up of people who use traditional tobacco products and electronic cigarettes in an exclusive and interchangeable way, the percentage of regular smokers increased to 32.6% among men and 18.7% among women (Poznańska et al., 2020). The ESC guidelines indicate that e-cigarettes can help to fight with addiction. Their beneficial effect may be due to behavioral changes, however, evidence for the efficacy of e-cigarettes in smoking cessation is limited and there are no safety data for long-term use (Pisinger, Døssing, 2014; Piepoli, Hoes, Agewall, Albus, Brotons, Catapano, Cooney, Corrà, Cosyns, Deaton, Graham, Hall, Hobbs, Løchen, Löllgen, Marques-Vidal, Perk, Prescott, Redon, Richter, ESC Scientific Document Group, 2016), so they have not yet been recognized as a recommended method of smoking cessation. The use of electronic cigarettes is becoming more and more common, and therefore the inclusion of an e-cigarette question in the Cardiovascular Diseases Prevention Program screening survey is well-founded.

Conclusions

Tobacco smoking prevalence is high and is one of the most widespread cardiovascular risk factors. Thanks to the current data on the prevalence of nicotine addiction, we are able to estimate the problem, the trend of chang-

es and react early, implementing effective preventive measures. It is important to effectively and universally conduct the prevention of cardiovascular diseases in Primary Healthcare Clinics, because it is an opportunity to implement education and modify behaviors that negatively affect the health of the population.

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