

Smoking and hyperglycaemia in blue-collar workers in Lubelskie region in Poland

Krzysztof Jacek Jankowski^A✉, Ewa Rudnicka-Drożak^B

Medical University of Lublin, Chair and Department of Family Medicine, Langiewicza 6a, 20-032 Lublin, Poland

^A ORCID: 0000-0003-4284-7878; ^B ORCID: 0000-0003-2264-1995

✉ k.jankowski91@wp.pl

ABSTRACT

Introduction: Tobacco smoking is responsible for 5 million deaths annually, with a 29% share of cardiovascular reasons. Diabetes and pre-diabetes states are responsible for many cases of ischaemic heart disease. Among blue-collar workers, circadian misalignment may elevate total cardiovascular risk.

Materials and methods: A retrospective analysis of data obtained by the National Health Fund from the Program for the Prevention of Cardiovascular Diseases in the Lublin Province in 2008–2018 was carried out; 26,226 visits were analyzed. The assessment included sociodemographic variables, data on nicotine use, and fasting glucose. The χ^2 test was used to test the relationship between the 2 qualitative features, and the Pearson linear correlation for the quantitative features. The analyses were performed using IBM SPSS Statistics for Windows, version 25, with a significance level of $\alpha = 0.05$ for 2-tailed tests.

Results: Hyperglycaemia was observed in 14.07% of the research group, 1.37% of the whole group was diagnosed with glucose level ≥ 126 mg/dL; 54.34% of patients reported smoking history ($n = 14,250$). Current smokers constituted 33.04% of the study group ($n = 8,665$) and 21.30% of patients were past smokers ($n = 5,585$). The mean age of smoking initiation was 24.68 years and the mean cigarettes use was 15.66. The correlation between the incidence of analyzed risk factors and age and sex was statistically significant ($p < 0.001$).

Conclusions: Men and respondents of more advanced age have a higher burden of cardiovascular risk factors. The prevalence of smoking and hyperglycaemia in surveyed workers is relatively high. Therefore, blue-collar workers are a social group in need of more extensive prophylaxis for cardiovascular diseases.

Keywords: diabetes mellitus; smoking; blue-collar workers; cardiovascular risk; risk factor.

INTRODUCTION

Tobacco smoking is responsible for 5 million deaths annually (12% of all deaths) [1]. The use of tobacco is a well-known risk factor for many diseases, among which the leading group is lung cancers, and also gastrointestinal and urinary tract neoplasms. Nicotinic acid also contributes to the development of chronic obstructive pulmonary disease and cardiovascular diseases [2]. Cardiovascular disease accounts for 29% of tobacco-related deaths [3].

Diabetes is a common clinical problem – it was estimated that 60 million European adults were diagnosed with type 2 diabetes in 2017 [4]. It is assumed that by 2045 as many as 600 million people in the world will be affected by diabetes and the same amount by prediabetes [5]. Hyperglycemic conditions are a well-known risk factor for cardiovascular disease. A meta-analysis of 102 prospective studies showed that the presence of diabetes, independently of other risk factors, doubles the risk of cardiovascular events, such as ischemic heart disease, ischemic stroke, and death from cardiovascular disease. It has been proven that an increased risk of developing ischemic heart disease is also observed in the diagnosis of pre-diabetes, which increases with increasing blood glucose levels [6]. A diagnosis of diabetes without markers of organ damage or other serious risk factors places the patient at high risk of death from a cardiovascular event according to SCORE, and diabetes with organ damage or at least 1 risk factor such as hypertension, smoking, or dyslipidemia places patients in a very high-risk group.

In addition to the described risk factors, manual workers are exposed to specific working conditions and disturbances in circadian rhythms related to shift work. It was proven that this work system is associated with a significantly higher risk of cardiovascular disease. A large meta-analysis showed that ischaemic heart disease risk is 23% higher in shift workers [7]. Blue-collar shift workers experience circadian misalignment, known in literature as ‘social jetlag’ described as an incompatibility between the schedules of work hours and the internal biological clock. A systematic review depicted a strong positive correlation between the social jetlag and smoking, body mass index, and heart rate [8]. However, social jetlag has recently been described as an independent cardiovascular risk factor [9].

Screening tests for modifiable, classical risk factors should be accessible to patients, therefore they are carried out in primary healthcare clinics. Most of the Polish inhabitants are covered by the services of primary healthcare doctors [10]. It is reported that nearly 1/5 of the appointments (15–20%) are for general medical examinations and health checks [11]. One of them is a Cardiovascular Diseases Prevention Program visit. Until July 1, 2022, the program was addressed to people on the list of health care providers. The criterion for inclusion in the program was the calendar age at the time of the study: 35, 40, 45, 50, 55 years, no previous diagnosis of cardiovascular disease, and no participation in the program in the last 5 years.

To our knowledge, there is a lack of studies assessing cardiovascular risk factors among vast groups of blue-collar workers in

Poland. Therefore, we aimed to analyze the prevalence of 2 main cardiovascular risk factors in an extensive group of respondents taking part in the Cardiovascular Diseases Prevention Program.

The aim of the study was to assess the prevalence of smoking, hyperglycaemia, and associated factors in blue-collar workers from the Lubelskie region.

MATERIALS AND METHODS

This study was based on a retrospective analysis of data obtained by the National Health Fund as part of the Program for the Prevention of Cardiovascular Diseases in the the Lublin Province in 2008–2018. The study population consisted of patients who were 35, 40, 45, 50, and 55 years old in a given calendar year and were included in the Cardiovascular Disease Prevention Program. The assessment included sociodemographic variables, present and past nicotine use (number of cigarettes smoked, time interval), and fasting glucose levels. The distribution of quantitative variables was described by specifying the mean value and standard deviation (SD). 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 χ^2 test was used to test the relationship between the 2 qualitative features, and the Pearson linear correlation between the quantitative features. The analyzes were performed using IBM SPSS Statistics for Windows, version 25 (IBM Corp., Armonk, N.Y., USA). The significance level was assumed to be $\alpha = 0.05$ for 2-tailed tests.

RESULTS

In this study, we analyzed data from 26,226 prophylactic visits held in Primary Healthcare Clinics. Patients aged at 35 predominated in the research group. Men were more numerous (51.4%, $n = 13,566$) and women constituted 48.3% of the whole group ($n = 12,660$) – Table 1.

The majority of patients reported some kind of smoking history (54.3%, $n = 14,250$). Current smokers constituted 33.0% of the study group ($n = 8,665$) and over 1/5 of patients were past smokers (21.3%, $n = 5,585$). Their time of tobacco abstinence was 8.9 years on average, while the mean time of smoking was reported as 11.8 years. The mean age of tobacco smoking initiation was 24.7 years. Respondents in the study smoked 15.7 cigarettes on average (17.8 in men, 12.3 in women) – Table 2.

TABLE 2. Smoking in age groups

Smoking	Age (years)									
	35		40		45		50		55	
	n	%	n	%	n	%	n	%	n	%
Current	2110	31.82	1955	31.12	1838	33.42	1560	34.64	1202	36.33
In the past	1278	19.27	1242	19.76	1146	20.84	1073	23.82	846	25.57
Never	3243	48.91	3086	49.12	2515	45.74	1871	41.54	1261	38.10

$p > 0.001$

Among factors influencing smoking prevalence, we observed advanced age and male gender caused an increase in frequency. Current smokers among females were almost 1.5 times less numerous than in men (26.7% vs. 38.9%) and in 55-year-old patients, current smoking was the most frequent (Tab. 3).

The majority of respondents showed normoglycaemia (80.6%). Although hyperglycaemia was observed in 14.1% of the research group, only 1.4% of the whole group was diagnosed with glucose levels greater or equal 126 mg/dL, and 12.7% presented with impaired fasting glucose (Tab. 4).

Nearly 2.5 times higher incidence of glycaemia ≥ 126 mg/dL was observed in the group of 50-year-old patients compared to patients aged 35. The correlation between the higher incidence of hyperglycemia and more advanced age was statistically significant ($p < 0.001$). Furthermore, a significant difference in the prevalence of hyperglycaemia was observed between sexes, with a predominance of men among hyperglycaemic patients (Tab. 5, 6).

DISCUSSION

According to estimations, in 2017 even 25% of Europeans used tobacco products every day. In this region, Poland is a country with a high prevalence of tobacco smoking, being ranked 8 among all European Union countries [12].

The frequency of smoking we describe is higher compared to the data obtained from large population studies. The authors of WOBASZ, NATPOL, and POLSCREEN projects assessed it as 25.8–31.5% among men and 14.3–20.9% among women [13, 14, 15, 16, 17]. It is highly probable that these differences result from the selection of the research group, which in our project consisted of blue-collar workers only. Similarly to our population, also in the studies analyzed above, there was a significant advantage of men over women in the group of smokers.

In more recent studies, the prevalence of smoking was much lower. In a 2019 survey on a representative group of the

TABLE 1. Structure of age

Age	n	%
35	6631	25.28
40	6283	23.96
45	5499	20.97
50	4504	17.17
55	3309	12.62

TABLE 3. Smoking according to sex

Smoking	Men		Women	
	n	%	n	%
Current	5288	38.98	3377	26.67
In the past	3500	25.80	2085	16.47
Never	4778	35.22	7198	56.86

p > 0.001

TABLE 4. Glycaemia in the research group

Glycaemia (mg/dL)	n	%
<72	1407	5.36
72–99	21128	80.57
100–125	3332	12.70
≥126	359	1.37

Polish population, it was 25.8% of men and 19.2% of women [17]. According to the National Institute of Public Health, in 2018 the numbers were 27.8% of men and 15.4% of women [18].

It was previously described that blue-collar workers may be stronger addicted to nicotine than white-collar workers. In a 2019 study using the Fagerstrom test for an orientation assessment of the depth of biological physical addiction to nicotine, the score was 4.4 in blue-collar, and 3.8 in white-collar workers [19]. Despite this fact, most population-based studies in Poland showed a higher mean number of cigarettes smoked. In the WOBASZ and WOBASZ II study, in the 35–44 age group, the average number of cigarettes smoked was 19.6 and 17.1 for men, and 14.1 and 12.5 for women, respectively. Respondents aged 45–54 smoked an average of 19.4 and 17.6 (men) and 14.5 and 12.7 cigarettes (women) [13].

There are few articles describing the prevalence of tobacco smoking among blue-collar workers in Poland. However, in the available papers, the percentage of smoking respondents was lower than in the study population – 31.3% [20].

An estimated 463 million adults aged 20–79 suffered from diabetes in 2019, which was 9.3% of the population. By 2045, its prevalence may increase to nearly 11%. According to the International Diabetes Federation, an organization of more than 240 national diabetes associations in Europe, diabetes has an incidence of around 8.9% [21].

Analyzed data covered 1 determination of the glucose concentration in the venous blood plasma, which is sufficient for

TABLE 5. Glycaemia in age groups

Glycaemia (mg/dL)	Age (years)									
	35		40		45		50		55	
	n	%	n	%	n	%	n	%	n	%
<72	460	6.94	335	5.33	294	5.35	204	4.53	114	3.45
72–99	5529	83.38	5151	81.98	4402	80.05	3541	78.62	2505	75.70
100–125	582	8.78	719	11.44	725	13.18	687	15.25	619	18.71
≥126	60	0.90	78	1.24	78	1.42	72	1.60	71	2.15

p > 0.001

TABLE 6. Glycaemia according to sex

Glycaemia (mg/dL)	Men		Women	
	n	%	n	%
<72	613	4.52	794	6.27
72–99	10568	77.90	10560	83.41
100–125	2140	15.77	1192	9.42
≥126	245	1.81	114	0.90

p > 0.001

the diagnosis of abnormal glycaemia. According to the guidelines of the Polish Diabetes Association, the diagnosis of diabetes mellitus in the absence of symptoms of hyperglycaemia requires 2 tests on 2 different days [4]. This is a limitation of our work even though other population studies are usually based on a single blood glucose test. The report of the Committee of Experts on the Diagnosis and Classification of Diabetes for epidemiological research allows for the use of a single blood glucose determination [22]. However, it is suggested that the term diabetes should not be used but “diabetic type” [23]. It is clear that in some cases, after retesting fasting blood glucose, the diagnosis of diabetes may not be confirmed.

Data based on the so-called registered morbidity from the national payer estimated the prevalence of diabetes in 2018 at 9.1% of the Polish population. Women predominated (9.5%) compared to men (8.6%) [24]. The authors of any of the analyzed studies did not notice a similar relationship. This fact may be related to greater awareness of the disease among women and more frequent use of healthcare services. Moreover, other authors, relying on a study methodology similar to the report of the National Health Fund, stated that in 2013 diabetes was more widespread in Poland than in the group we analyzed – it occurred in 6.1% of men and 5.1% of women [25]. Walicka et al. assessed that in 2010–2014 diabetes was a disease diagnosed in 4.47% of the country’s population [26].

Large Polish population studies describe a higher frequency of hyperglycemic states than in the studied material. In the WOBASZ study, diabetes occurred in 6.8% of the population, and impaired fasting glucose in 9.5% [27]. According to the NATPOL project team, the prevalence of diabetes was 6.7% in NATPOL 2011 [28] and 6.8% in NATPOL III PLUS [29], respectively. In both of these studies, the criterion for qualifying a patient to the group of patients with diabetes was the concentration of glucose

≥ 126 mg/dL obtained in a single measurement or the patient's declaration of prior diagnosis and/or treatment of diabetes.

It seems worthwhile to compare the incidence of hyperglycemic disorders in relation to age. The incidence of diabetes and carbohydrate disorders increases with age, reaching 19.9% among people aged 65–79 [30]. In this context, it is crucial recalling once again that the study group consisted of patients aged 35–55, which may result in a lower prevalence of diabetes in our study, compared to the results of Polish population studies on patients aged 18–79 [27, 28, 29]. In the analyzed material, an increase in the frequency of hyperglycemic states with age was also observed ($p < 0.001$).

CONCLUSIONS

Men and respondents in more advanced age have a higher burden of cardiovascular risk factors. The prevalence of smoking and hyperglycaemia in the surveyed blue-collar workers was relatively high. Therefore, blue-collar workers are a social group in need of more extensive prevention and prophylaxis of cardiovascular diseases.

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