

THE PREVALENCE OF CIGARETTE SMOKING, E-CIGARETTE USE AND HEATED TOBACCO USE AMONG POLICE EMPLOYEES IN POLAND: A 2020 CROSS-SECTIONAL SURVEY

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Abstract

Objectives: Uniformed services such as police employees are exposed to acute and chronic stressful events at work that may lead to tobacco use. This study aimed to assess the prevalence of cigarette smoking, e-cigarette use and heated tobacco use among police employees in Poland, and to investigate personal characteristics associated with tobacco or e-cigarette use. **Material and Methods:** This cross-sectional study was carried out in June–July 2020 on a randomly selected sample of 8789 police employees from the Mazowieckie Province, Poland. **Results:** Completed questionnaires were obtained from 5082 police employees (79.2% being police officers) with an overall response rate of 57.8%. Smoking ≥ 100 cigarettes or similar amounts of other tobacco products was declared by 54.6% of the respondents, with significant differences ($p < 0.001$) between males (56.8%) and females (50.3%). Daily cigarette smoking was declared by 19.5% of the respondents, and 13.4% were occasional cigarette smokers. Daily e-cigarette use was declared by 3.1% of the respondents, and 3.2% were occasional e-cigarette users. Daily heated tobacco use was declared by 2.6% of the respondents, and 2.9% were occasional heated tobacco users. Higher odds of occasional cigarette smoking were observed among men compared to women (OR = 1.254, 95% CI: 1.009–1.558), and among the participants aged 20–29 years (OR = 7.982, 95% CI: 3.066–20.775) or 30–44 years (OR = 3.730, 95% CI: 1.44–9.599) vs. those aged ≥ 60 years. Higher odds of occasional e-cigarette use were observed among the participants aged 20–29 years (OR = 4.554, 95% CI: 1.213–17.101) vs. those aged 60 years. Police employees with office-based work had lower odds of daily cigarette smoking vs. those with fieldwork (OR = 0.726, 95% CI: 0.55–0.946). Police officers had higher odds of daily heated tobacco use compared to civil workers (OR = 3.362, 95% CI: 1.325–8.534). **Conclusions:** The authors observed a marked proportion of police employees who declared occasional tobacco or e-cigarette use, which may indicate the common social smoking phenomenon in this occupational group. *Int J Occup Med Environ Health.* 2021;34(5):629–45

Key words:

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INTRODUCTION

Tobacco use is a leading cause of preventable deaths [1,2]. According to the World Health Organization (WHO) estimates, every year >8 million tobacco-related deaths are noticed globally [3]. In 2018, out of all cancer cases in the WHO European region, 27% were attributed to tobacco use [4]. Poland is a country with a heavy burden of tobacco-related diseases, where the annual burden of tobacco-attributable deaths is estimated at over >70 000 deaths [2]. Overall, it is estimated that smoking costs the EU countries at least EUR 100 billion per year [5].

In the WHO European region, the average rate of tobacco use is 26%, with significant gaps between men (34%) and women (19%) [4,5]. According to the data from the Special Eurobarometer 458 survey carried out in 2017, the highest prevalence of tobacco use was observed in Greece (37%) and the lowest in Sweden (7%). The prevalence of tobacco use is especially high in the Central and Eastern European region. Out of the 28 EU countries analyzed in Special Eurobarometer 458, Poland was in the sixth place in terms of the rate of tobacco use [5].

In recent years, new forms of nicotine-containing products such as electronic cigarettes (e-cigarettes) and heated tobacco products have been gaining popularity [6]. In 2017, the prevalence of daily e-cigarette use in the EU ranged from 4.7% in the United Kingdom to 0.2% in Bulgaria [7]. However, the prevalence of e-cigarette use is the highest among adolescents and young adults, and can reach up to 27% among students aged 13–19 years [8]. In 2014, the first heated tobacco products were launched in Europe, and the number of countries where they are available is constantly growing [6].

Data on the prevalence of heated tobacco use in Europe are very limited; nevertheless, it is estimated that approximately 1% of adult Europeans are daily heated tobacco users [6]. The proportion of Europeans who smoke dropped from 32% in 2006 to 26% in 2017 [9]. Nevertheless, there are disparities in smoking prevalence

according to the socioeconomic status [10,11]. Income, education, and occupation affect the risk of tobacco use. Blue-collar workers are at higher risk than white-collar workers when it comes to ever or current smoking [11]. Among Europeans who are occupationally active (employed or self-employed), the highest prevalence of tobacco use was observed among manual workers (38%) and self-employed (34%), and the lowest among managers (23%) [5].

The workplace is a major source of secondhand smoke (SHS) exposure for adults that contributes to ill health and diseases. Smoking in the workplace generates operational costs and reduces productivity affecting the health of workers [12]. Making workplaces smoke-free protects non-smokers from SHS but also encourages smokers to quit or reduce consumption [13]. A smoke-free policy should address the needs of different social and occupational groups. To develop an effective smoke-free policy, smoking behaviors in the general population as well as in individual risk groups should be evaluated.

Uniformed services such as police employees are exposed to acute and chronic stressful events at work. Occupational stress among police employees may lead to tobacco use [14]. While the prevalence of tobacco use in the general population in Poland is well documented [15], there is a lack of epidemiological studies on tobacco use among police employees in Poland.

This study aimed to assess the prevalence of cigarette smoking, e-cigarette use and heated tobacco use among police employees in Poland, and to investigate personal characteristics associated with tobacco or e-cigarette use.

MATERIAL AND METHODS

Participants

This cross-sectional study was carried out in June–July 2020 on a randomly selected sample of 8789 police employees from the Mazowieckie Province, Poland. The computer-assisted web interview (CAWI) tech-

nique was used. A random quota sample was selected from 17 800 police employees (officers and civil workers) from the Mazowieckie Province, Poland. The structures of the police in the Mazowieckie Province include the Mazowieckie garrison and the Warsaw garrison (the capital city of Warsaw and the surrounding poviats), which employ the largest number of police workers, among all 16 provinces (administrative regions) in Poland. The group selection technique (including the probability of drawing proportional to the size of the group) and the stratified selection technique were applied to provide a random selection of a study sample. All employees of the randomly selected police units were invited to participate in the study. Participation in the study was voluntary and anonymous. The study protocol was reviewed and approved by the Ethical Review Board at the Medical University of Warsaw, Warsaw, Poland (consent number: KB/87/2020).

Study questionnaire

The research tool was an original questionnaire developed for the purpose of this study. The questionnaire included 30 questions related to risk factors for COVID-19 as well as methods of SARS-CoV-2 infection prevention. Due to the previous scientific data on tobacco and e-cigarettes [16,17] as potential risk factors for a SARS-CoV-2 infection, the authors decided to include questions on tobacco and e-cigarette use in the questionnaire developed in their study. Questions also addressed personal characteristics, including gender (male or female), age (years), the place of residence, living conditions, taking care of children, the type of employment (officers or civil workers), the service type, the presence of the chronic condition, and a self-reported health status.

Ever smoking was defined according to the answers to the questions: "Have you ever smoked ≥ 100 cigarettes (or a similar amount of other tobacco products, e.g., pipes, cigars, cigarillos) in your lifetime?" Current smoking was

defined according to the answers to the questions: "In the last 6 months, did you smoke or use the following nicotine-containing products: 1) cigarettes; 2) electronic cigarettes (e-cigarettes); 3) heated tobacco products (e.g., IQOS or glo)?" with 3 possible answers: "yes, daily," "yes, occasionally," and "no". This study was carried out as part of a research project aimed at investigating the prevalence of SARS-CoV-2 infections among police employees. Due to the fact that smoking and vaping were considered risk factors for a SARS-CoV-2 infection, the authors used a 6-month time frame (in contrary to 30 days which is widely used) to evaluate the smoking/vaping status of the participants during the COVID-19 pandemic.

Statistical analysis

The data were analyzed using SPSS ver. 26 (IBM, Armonk, NY, USA). The distribution of categorical variables was shown by frequencies and proportions along with 95% confidence intervals (CIs). Statistical testing to compare categorical variables was completed using the independent samples χ^2 test. Associations between personal characteristics (gender, age, place of residence, housing conditions, type of employment [officers vs. civil workers], service type, self-reported health status and presence of chronic condition) with respect to the use of nicotine-containing products were conducted using multiple logistic regression models. A total of 6 multivariate logistic regression models were developed. The use of the following nicotine-containing products was analyzed:

- traditional cigarettes,
- e-cigarettes,
- heated tobacco products.

Two models were developed for each of the nicotine-containing products, using 2 variants:

- daily use vs. non-use,
- occasional use vs. non-use.

These variables were introduced to the model as a series of 0–1 variables (dummy variables).

RESULTS

Characteristics of the study population

Completed questionnaires were obtained from 5082 police employees (79.2% being police officers) with an overall response rate of 57.8%. Two-thirds of the respondents were males. Most of the respondents (59%) were aged 30–44 years and served in preventive service (43%). Detailed characteristics of the study population is presented in Table 1.

Ever tobacco use

Ever cigarette smoking (or smoking a similar amount of other tobacco products) was declared by 54.6% (95% CI: 53.3–56.0) of the respondents, with significant differences ($p < 0.001$) between males (56.8%, 95% CI: 55.1–58.5) and females (50.3%, 95% CI: 47.9–52.7). The percentage of the participants who had ever smoked was the highest among those aged ≥ 60 years (69.5%, 95% CI: 61.6–76.6) and the lowest among the youngest participants aged 20–29 years (48.8%, 95% CI: 45.1–52.6) ($p < 0.001$). The highest percentage of the respondents who had ever smoked was recorded among those living in cities with 20 000–100 000 inhabitants (59.1%; 95% CI: 55.9–62.3), and the lowest among inhabitants of rural areas (49.6%, 95% CI: 46.9–52.3) ($p < 0.001$).

In addition, the percentage of the respondents who had ever smoked was lower among those who had ≥ 1 chronic condition (53.1%, 95% CI: 51.4–54.8), compared to the participants without a chronic condition (57.5%, 95% CI: 55.2–59.8, $p < 0.01$). The percentage of ever smokers observed among the participants who defined their health status as very good (50.6%, 95% CI: 48.3–52.9) was significantly lower ($p < 0.001$), compared to those who declared bad or very bad health status (68.4%, 95% CI: 46.1–85.6). There were no statistically significant differences in ever tobacco use depending on the housing conditions, the type of employment (officers vs. civil workers) and the service type ($p > 0.05$).

Current cigarette smoking

Daily cigarette smoking was declared by 19.5% (95% CI: 18.4–20.6) of the respondents while occasional cigarette smoking was declared by 13.4% (95% CI: 12.5–14.4). The prevalence of daily cigarette smoking as well as occasional cigarette smoking was higher ($p < 0.01$) among men than among women, respectively 19.7% (95% CI: 18.4–21.1) vs. 19.0% (95% CI: 17.2–20.9), and 14.4% (95% CI: 13.2–15.6) vs. 11.5% (95% CI: 10.0–13.1). The highest prevalence of daily cigarette smoking (21.2%) was observed among those living in cities with 20 000–100 000 inhabitants ($p = 0.03$) as well as those respondents who declared living alone (24.7%, $p < 0.05$). Moreover, the highest prevalence of occasional (16.7%) or daily (23.8%) cigarette smoking was observed among the respondents who occasionally had children at home ($p < 0.001$). The prevalence of occasional cigarette smoking was higher among police officers (14.4%), compared to civil workers (9.6%, $p < 0.001$). A higher prevalence of cigarette smoking was observed among those respondents who declared a moderate, bad or very bad health status compared to those who declared a good or very good health status ($p < 0.001$). There were no significant differences ($p > 0.05$) in the prevalence of cigarette smoking depending on the presence of ≥ 1 chronic condition ($p = 0.3$). Details are presented in Figure 1.

Current e-cigarette use

Daily e-cigarette use was declared by 3.1% (95% CI: 2.7–3.7) of the respondents while occasional e-cigarette use was declared by 3.2% (95% CI: 2.7–3.7). The prevalence of daily e-cigarette use as well as occasional e-cigarette use was higher ($p < 0.01$) among men than among women, respectively 3.5% (95% CI: 2.9–4.1) vs. 2.5% (95% CI: 1.9–3.4), and 3.6% (95% CI: 3.0–4.3) vs. 2.4% (95% CI: 1.7–3.2). The highest prevalence of daily or occasional e-cigarette use was the highest among the youngest respondents aged 20–29 years ($p < 0.001$). Moreover,

Table 1. Characteristics of the study population – a randomly selected sample of police employees from the Mazowieckie Province, Poland, June–July 2020

Variable	Participants (N = 5082)	
	n	%
Gender		
male	3382	66.5
female	1700	33.5
Age		
20–29 years	688	13.5
30–44 years	2999	59.0
45–59 years	1254	24.7
≥60 years	141	2.8
Place of residence		
rural	1316	25.9
urban		
<20 000 inhabitants	742	14.6
20 000–100 000 inhabitants	900	17.7
100 001–500 000 inhabitants	633	12.5
>500 000 inhabitants	1491	29.3
Housing conditions		
living alone	389	7.7
living with ≥1 person	4693	92.3
Children at home		
yes, everyday	2903	57.1
yes, occasionally (alternating care)	168	3.3
no	2011	39.6
Type of employment		
police officer	4026	79.2
civil worker	1056	20.8
Service type		
management	338	6.7
preventive service	2188	43.0
criminal service	1263	24.9
support service	489	9.6
logistics and technical service	196	3.8
administrative worker	379	7.5
other	229	4.5

Table 1. Characteristics of the study population – a randomly selected sample of police employees from the Mazowieckie Province, Poland, June–July 2020 – cont.

Variable	Participants (N = 5082)	
	n	%
Type of work		
only office-based	1530	30.1
both office-based and fieldwork	2673	52.6
only fieldwork	879	17.3
Presence of chronic condition		
yes	1774	34.9
no	3308	65.1
Self-reported health status		
very good	1829	36.0
good	2832	55.7
fair	402	7.9
poor	19	0.4

the highest prevalence of daily or occasional e-cigarette use was observed among those respondents who lived in big cities with >500 000 inhabitants ($p < 0.001$). The lowest prevalence of daily e-cigarette use was observed among those respondents who lived with children on a daily basis ($p < 0.001$).

The prevalence of daily e-cigarette use as well as occasional e-cigarette use was higher ($p < 0.01$) among police officers than among civil workers, respectively 3.3% vs. 2.5%, and 3.6% vs. 1.6%. The prevalence of e-cigarette use also varied by type ($p < 0.05$). There were no significant differences ($p > 0.05$) in the prevalence of e-cigarette use depending on the housing conditions, the self-reported health status and the presence of ≥ 1 chronic condition ($p > 0.05$). Details are presented in Figure 2.

Current heated tobacco use

Daily heated tobacco use was declared by 2.6% (95% CI: 2.2–3.1) of the respondents while occasional heated tobacco use was declared by 2.9% (95% CI: 2.4–3.3). The high-

est prevalence of daily or occasional heated tobacco use was recorded among the youngest respondents aged 20–29 years ($p < 0.001$). Moreover, the highest prevalence of daily or occasional heated tobacco use was observed among those respondents who lived in big cities with >500 000 inhabitants ($p < 0.001$) as well as those who declared living alone ($p < 0.01$). The highest prevalence of heated tobacco use was observed among the respondents who worked in criminal service ($p < 0.05$). There were no significant differences ($p > 0.05$) in the prevalence of heated tobacco use depending on gender, housing conditions, the type of employment, the self-reported health status and the presence of ≥ 1 chronic condition ($p > 0.05$). Details are presented in Figure 3.

Patterns of tobacco and e-cigarette use

Among daily cigarette smokers (N = 989), 3.5% (95% CI: 2.5–4.8) declared daily use of e-cigarettes, and 8.1% (95% CI: 6.5–9.9) of daily smokers used e-cigarettes occasionally. Among occasional cigarette smokers (N = 681),

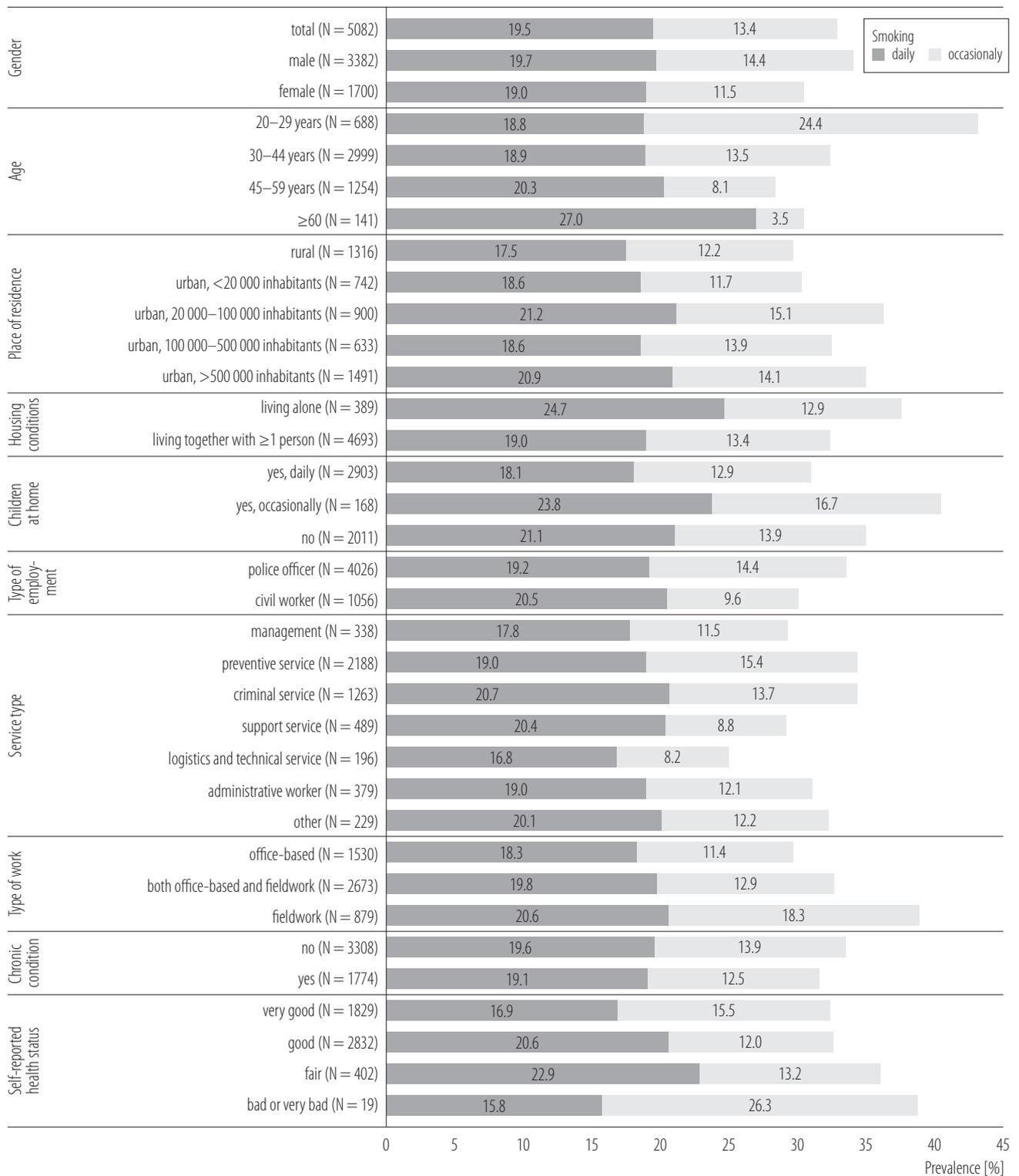


Figure 1. The prevalence of daily or occasional cigarette smoking by socioeconomic factors in a randomly selected sample of 5082 police employees from the Mazowieckie Province, Poland, June–July 2020

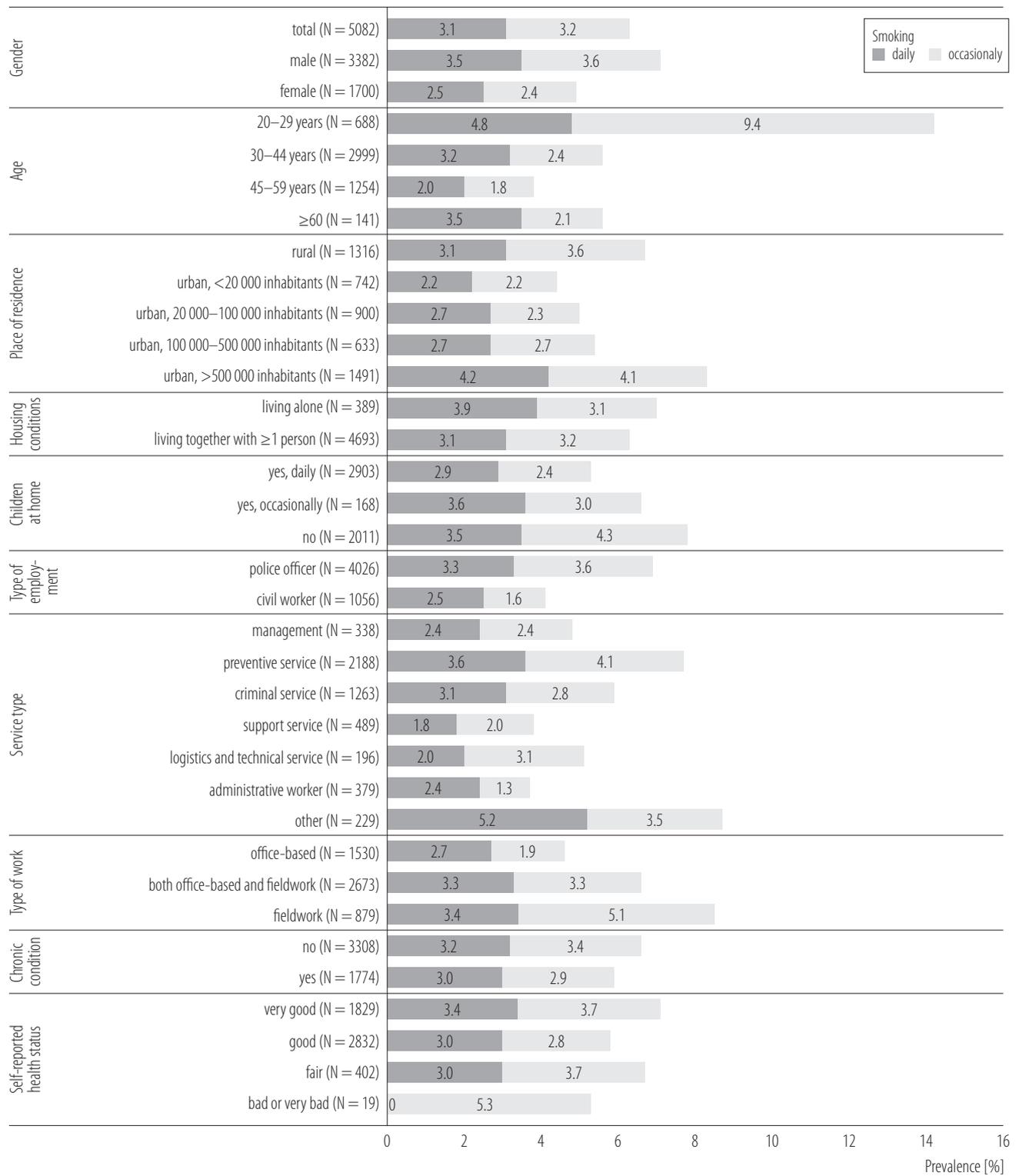


Figure 2. The prevalence of daily or occasional e-cigarette use by socioeconomic factors in a randomly selected sample of 5082 police employees from the Mazowieckie Province, Poland, June–July 2020

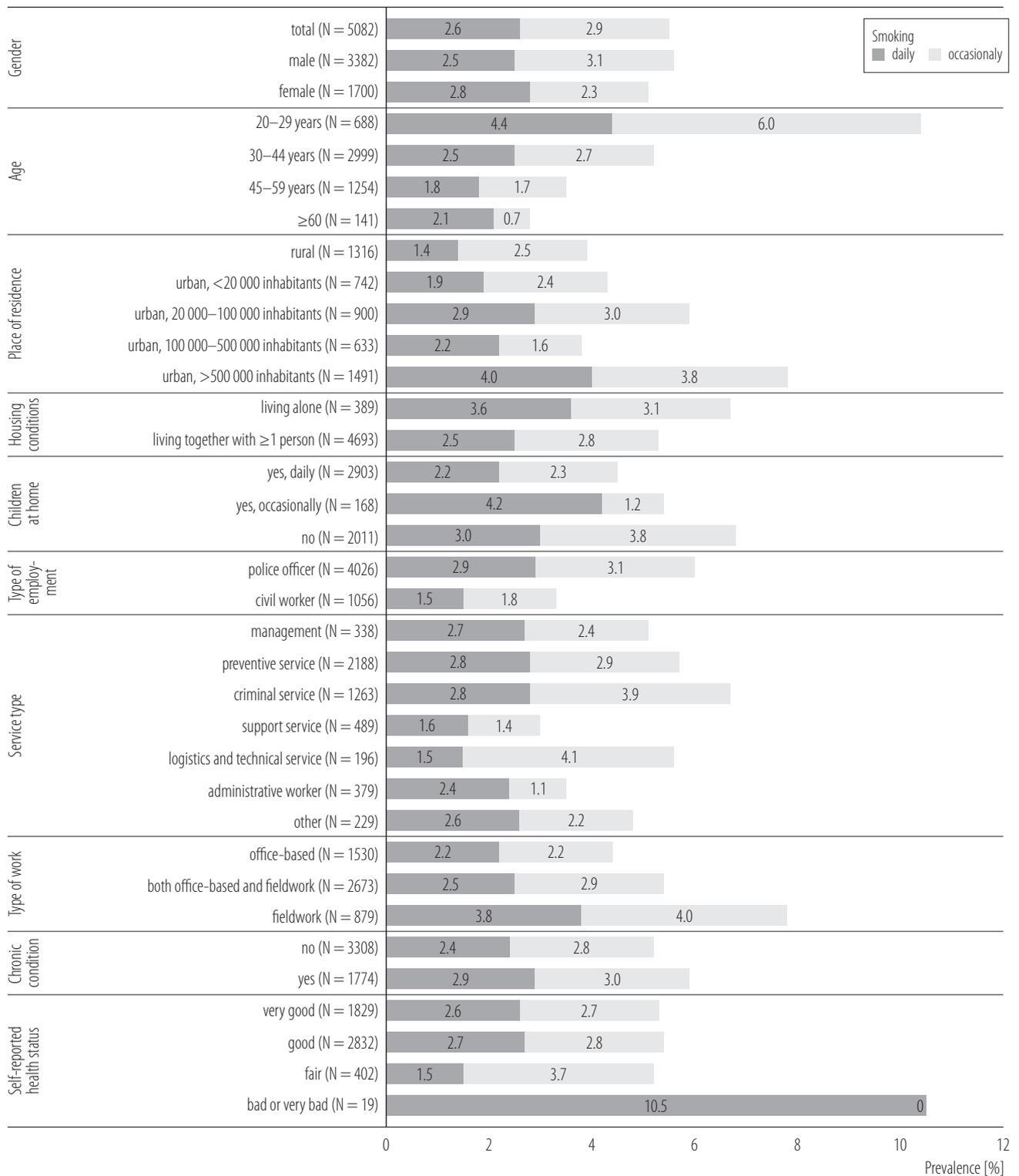


Figure 3. The prevalence of daily or occasional heated tobacco use by socioeconomic factors in a randomly selected sample of 5082 police employees from the Mazowieckie Province, Poland, June–July 2020

7.8% (95% CI: 5.9–10.0) declared daily e-cigarette use, and 8.2% (95% CI: 6.3–10.5) were occasional e-cigarette users.

Among daily cigarette smokers (N = 989), 4.3% (95% CI: 3.2–5.8) declared daily use of heated tobacco, and 7.6% (95% CI: 6.1–9.4) of daily smokers used heated tobacco occasionally. Among occasional cigarette smokers (N = 681), 7.5% (95% CI: 5.7–9.6) declared daily heated tobacco use, and 7.5% (95% CI: 5.7–9.6) were occasional heated tobacco users.

Among daily e-cigarette users (N = 160), 11.3% (95% CI: 7.1–16.8) declared daily use of heated tobacco, and 8.8% (95% CI: 5.1–13.9) of daily e-cigarette users declared occasional use of heated tobacco. Among occasional e-cigarette users (N = 162), 6.2% (95% CI: 3.2–10.7) declared daily heated tobacco use, and 23.5% (95% CI: 17.4–30.4) were occasional heated tobacco users.

Multiple logistic regression models

The results of the multivariate regression analyses are presented in Table 2.

Model I assessed the impact of socioeconomic factors on daily cigarette smoking (vs. non-smokers) (Cox & Snell R^2 at 0.011, Nagelkerke R^2 at 0.017). Higher odds of daily cigarette smoking were observed among the respondents living in towns with 20 000–100 000 inhabitants (OR = 1.343, 95% CI: 1.076–1.675) and in cities with >500 000 inhabitants (OR = 1.290, 95% CI: 1.059–1.571) vs. those living in rural areas. Higher odds of daily cigarette smoking were observed among those respondents who defined their health status as good (OR = 1.333, 95% CI: 1.129–1.574) or fair (OR = 1.628, 95% CI: 1.214–2.183) vs. those with a very good self-reported health status. Police employees with office-based work had lower odds of daily cigarette smoking vs. those with fieldwork (OR = 0.726, 95% CI: 0.55–0.946).

Model II assessed the impact of socioeconomic factors on occasional cigarette smoking (vs. non-smokers) (Cox

& Snell R^2 at 0.035, Nagelkerke R^2 at 0.059). Higher odds of occasional cigarette smoking were observed among men compared to women (OR = 1.254, 95% CI: 1.009–1.558), and among the participants aged 20–29 years (OR = 7.982, 95% CI: 3.066–20.775) or 30–44 years (OR = 3.730, 95% CI: 1.44–9.599) vs. those aged ≥ 60 years. Higher odds of occasional cigarette smoking were observed among the respondents living in towns with 20 000–100 000 inhabitants (OR = 1.457, 95% CI: 1.126–1.886), in cities with 100 000–500 000 inhabitants (OR = 1.400, 95% CI: 1.044–1.879) and in cities with >500 000 inhabitants (OR = 1.334, 95% CI: 1.057–1.685) vs. those living in rural areas. Higher odds of occasional cigarette smoking were observed among those respondents who defined their health status as good (OR = 1.446, 95% CI: 1.028–2.093) or fair (OR = 3.098, 95% CI: 1.040–9.227) vs. those with very good self-reported health status.

Model III assessed the impact of socioeconomic factors on daily e-cigarette use (vs. non-users) (Cox & Snell R^2 at 0.007, Nagelkerke R^2 at 0.029). None of the analyzed variables showed a statistically significant relationship.

Model IV assessed the impact of socioeconomic factors on occasional e-cigarette use (vs. non-users) (Cox & Snell R^2 at 0.022, Nagelkerke R^2 at 0.088). Higher odds of occasional e-cigarette use were observed among the participants aged 20–29 years (OR = 4.554, 95% CI: 1.213–17.101) vs. those aged ≥ 60 years, and those who defined their own health status as fair (OR = 2.085, 95% CI: 1.100–3.951) vs. those with a very good self-reported health status.

Model V assessed the impact of socioeconomic factors on daily heated tobacco use (vs. non-users) (Cox & Snell R^2 at 0.012, Nagelkerke R^2 at 0.054). Higher odds of daily heated tobacco use were observed among the respondents living in towns with 20 000–100 000 inhabitants (OR = 2.209, 95% CI: 1.196–4.079), and in cities with >500 000 inhabitants (OR = 3.104, 95% CI: 1.801–5.349)

Table 2. The correlation between daily and occasional tobacco or e-cigarette use and selected socioeconomic factors in a randomly selected sample of 5082 police employees from the Mazowieckie Province, Poland, June–July 2020

Variable	Logistic regression																	
	model I			model II			model III			model IV			model V			model VI		
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI		
Gender: male	1.167	0.974–1.399	1.254*	1.009–1.558	1.417	0.935–2.149	1.301	0.863–1.961	0.697	0.462–1.052	1.306	0.853–2.000						
Age																		
20–29 years	0.980	0.608–1.578	7.982*	3.066–20.775	1.632	0.549–4.848	4.554*	1.213–17.101	1.440	0.375–5.521	13.577*	1.700–108.409						
30–44 years	0.852	0.550–1.320	3.730*	1.449–9.599	1.073	0.376–3.061	1.071	0.289–3.966	0.791	0.214–2.929	6.161	0.785–48.326						
45–59 years	0.828	0.539–1.272	2.087	0.809–5.389	0.621	0.215–1.792	0.752	0.202–2.804	0.612	0.164–2.282	3.003	0.380–23.733						
City of residence																		
<20 000 inhabitants	1.072	0.844–1.362	1.029	0.772–1.373	0.688	0.382–1.238	0.627	0.349–1.124	1.460	0.719–2.966	0.990	0.550–1.782						
20 000–100 000 inhabitants	1.343*	1.076–1.675	1.457*	1.126–1.886	0.835	0.499–1.399	0.628	0.368–1.069	2.209*	1.196–4.079	1.208	0.716–2.040						
100 001–500 000 inhabitants	1.134	0.879–1.463	1.400*	1.044–1.879	0.945	0.528–1.693	0.948	0.531–1.692	1.863	0.912–3.808	0.703	0.341–1.450						
>500 000 inhabitants.	1.290*	1.059–1.571	1.334*	1.057–1.685	1.391	0.921–2.101	1.217	0.810–1.828	3.104*	1.801–5.349	1.492	0.951–2.342						
Living together with children: no	1.157	0.985–1.358	1.021	0.843–1.236	1.181	0.824–1.691	1.348	0.937–1.940	1.087	0.735–1.609	1.611*	1.109–2.342						
Presence of a chronic condition: yes	0.876	0.745–1.030	1.071	0.883–1.298	1.051	0.732–1.508	1.168	0.801–1.703	1.370	0.934–2.010	1.297	0.889–1.892						
Self-reported health status																		
good	1.333*	1.129–1.574	1.053	0.873–1.270	1.098	0.770–1.566	1.182	0.824–1.698	1.224	0.826–1.814	1.478*	1.007–2.171						
fair	1.628*	1.214–2.183	1.466*	1.028–2.093	1.174	0.594–2.318	2.085*	1.100–3.951	0.667	0.271–1.640	2.147*	1.118–4.124						
bad or very bad	1.292	0.354–4.712	3.098*	1.040–9.227	0.000	0.000–0.000	3.507	0.441–27.866	4.773	0.980–23.254	0.000	0.000–0.000						
Police officer	0.790	0.568–1.100	1.165	0.768–1.767	0.945	0.434–2.060	1.913	0.824–4.445	3.362*	1.325–8.534	0.931	0.413–2.098						
Service type																		
management	1.065	0.652–1.740	0.864	0.473–1.578	1.042	0.316–3.439	1.107	0.281–4.357	0.628	0.178–2.209	3.070	0.735–12.817						
preventive	1.082	0.714–1.641	0.790	0.472–1.320	1.428	0.531–3.837	1.074	0.324–3.560	0.442	0.145–1.346	2.153	0.599–7.733						

Table 2. The correlation between daily and occasional tobacco or e-cigarette use and selected socioeconomic factors in a randomly selected sample of 5082 police employees from the Mazowieckie Province, Poland, June–July 2020 – cont.

Variable	Logistic regression											
	model I		model II		model III		model IV		model V		model VI	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Service type – cont.												
criminal	1.276	0.841–1.937	0.896	0.533–1.506	1.130	0.413–3.092	0.820	0.242–2.778	0.524	0.171–1.605	3.918*	1.106–13.886
support	1.089	0.765–1.549	0.697	0.436–1.114	0.816	0.314–2.123	1.469	0.475–4.544	0.492	0.173–1.405	1.589	0.452–5.585
logistics and technical	0.740	0.458–1.194	0.580	0.306–1.101	0.789	0.230–2.706	1.597	0.443–5.758	0.443	0.107–1.837	4.107*	1.162–14.515
other	1.037	0.663–1.621	0.830	0.469–1.469	2.163	0.829–5.641	1.404	0.401–4.920	0.612	0.183–2.049	2.059	0.510–8.310
Type of work												
office-based	0.726*	0.557–0.946	0.838	0.618–1.135	1.343	0.758–2.378	0.742	0.411–1.338	0.658	0.349–1.240	0.772	0.417–1.430
both office-based and fieldwork	0.831	0.663–1.043	0.787	0.610–1.014	1.313	0.810–2.126	1.135	0.727–1.772	0.599	0.353–1.018	0.669	0.398–1.127
Constant	0.275		0.044		0.014		0.008		0.017		0.001	

Model I – daily cigarette smoking vs. non-smoking; model II – occasional cigarette smoking vs. non-smoking; model III – daily e-cigarette use vs. non-use; model IV – occasional e-cigarette use vs. non-use; model V – daily heated tobacco use vs. non-use; model VI – occasional heated tobacco use vs. non-use.

* Regression baseline: gender (female); age group (≥ 60 years); place of residence (rural); living together with children at home; civil worker presence of a chronic condition (yes); self-reported health status (very good); service (administration); type of employment (fieldwork).

Bolded are statistically significant values.

vs. those living in rural areas. Police officers had higher odds of daily heated tobacco use compared to civil workers (OR = 3.362, 95% CI: 1.325–8.534).

Model VI assessed the impact of socioeconomic factors on occasional heated tobacco use (vs. non-users) (Cox & Snell R^2 at 0.015, Nagelkerke R^2 at 0.064). Higher odds of occasional heated tobacco use were observed among the participants aged 20–29 years (OR = 13.577, 95% CI: 1.700–108.409) vs. those aged ≥ 60 years, and among the participants living without children (OR = 1.611, 95% CI: 1.109–2.342) vs. those who had children at home. Higher odds of occasional heated tobacco use were observed among those respondents who defined their health status as good (OR = 1.478, 95% CI: 1.007–2.171) or fair (OR = 2.147, 95% CI: 1.118–4.124) vs. those with a very good self-reported health status. Those participants who served in the criminal service (OR = 3.918, 95% CI: 1.106–13.886) or the logistics and technical service (OR = 4.107, 95% CI 1.162–14.515) had higher odds of occasional heated tobacco use compared to the participants engaged in other types of service.

DISCUSSION

To the best of the authors' knowledge, this is the most up-to-date epidemiological study on the prevalence of tobacco and e-cigarette use among police employees in Poland. These findings indicate that more than half of the police employees had ever smoked cigarettes and one-fifth of them were daily smokers. Alternative forms of nicotine delivery, such as e-cigarettes and heated tobacco products, were less popular than traditional cigarettes; however, the proportion of occasional e-cigarette users or heated tobacco users was higher than the proportion of daily e-cigarette users or heated tobacco users. Gender, age, the place of residence and the self-reported health status significantly shaped smoking behaviors.

Monitoring tobacco use is the first point of the 6 MPOWER tobacco control measures that may help the WHO

Member States reduce the demand for tobacco use [18]. Findings from 5 waves of a nationwide cross-sectional survey on tobacco use showed that the rate of tobacco use in Poland had decreased from 31% in 2011 to 21% in 2019 [15]. Despite the significant reduction in the number of smokers in Poland, there are still some social inequalities in terms of tobacco use [19]. Occupational stress and anxiety are associated with tobacco use [14,20]. Due to their working conditions, police employees can be classified to a higher risk group when it comes to tobacco use.

According to Special Eurobarometer 458, in 2017, almost half (49%) of EU citizens smoked ≥ 100 tobacco products during their lifetime [5]. In Poland, 52% of the general population had ever smoked [5]. In the present study, 54.6% of the participants had ever smoked, this figure being higher compared to those observed in the general Polish population. The authors observed some gender differences in ever smoking, which is in line with previously published data [5,9,15]. The prevalence of ever smokers increased with age. Preventing smoking initiation is one of the key tobacco control activities. The age differences in ever tobacco use may result from the decrease in tobacco consumption among Poles. The percentage of ever smokers was lower among the participants with a chronic condition. The presence of chronic conditions, especially respiratory illness, may discourage smoking initiation.

The proportion of daily cigarette smokers (19.5%) was comparable to those observed in the general population (21%) [15]. However, gender differences in daily smoking among police employees were lower, compared to the general population. In a national cross-sectional survey conducted in 2019 in Poland, daily smoking was declared by 18% of females and 24.4% of males [15]. In this study, the proportion of smokers was, respectively, 19% among females and 19.7% among males. It can be hypothesized that this difference resulted from the fact that police employees are a relatively homogenous group, so their behaviors are comparable regardless of gender. The place

of residence was significantly associated with the risk of daily tobacco use. In this study, the highest odds of daily tobacco use were observed among the respondents living in towns with 20 000–100 000 inhabitants and in cities with >500 000 inhabitants. This is in line with the observation from the 2019 nationwide cross-sectional survey, where the highest odds of daily tobacco use were observed among the respondents living in towns with 20 000–100 000 inhabitants [15].

In the past decade, an alternative form of nicotine delivery, such as e-cigarettes and heated tobacco products, were gaining popularity [6]. In this study, daily vaping (e-cigarette use) was declared by 3.1% of the participants, and 2.6% were daily heated tobacco users. The proportion of the participants using those novel nicotine-containing products was much higher, compared to the general population where the proportion of daily e-cigarette users or heated tobacco users was 1.4% and 0.4%, respectively [15]. It can be hypothesized that, due to the advertising of these products as being less harmful to health (no scientific consensus on this matter), these products are more often chosen by police employees who, considering their working conditions, must maintain physical fitness and good health [6]. Moreover, the use of non-combustible nicotine-containing products by police officers may result from the fact that their use is difficult to detect in rooms or vehicles.

In this study, a substantial proportion of police employees were occasional cigarette smokers. The proportion of occasional cigarette smokers in this study was 10 times higher, compared to the general population (13.4% vs. 1.3%) [15]. Moreover, the proportion of occasional e-cigarette users or heated tobacco users was comparable to the proportion of daily users. Such a high proportion of occasional tobacco or e-cigarette users among police employees may indicate a social smoking phenomenon [21,22]. Social smoking is defined as smoking primarily in social contexts [21]. Presumably, those police employees who are on duty within the same group for a long time

may be vulnerable to smoke in this kind of a social situation. Moreover, smoking can be perceived as a habit which strengthens the sense of belonging to a particular group. The highest odds of occasional cigarette smoking were observed among the youngest age groups, which may suggest that those subjects smoke occasionally to maintain group acceptance among older colleagues [23]. In addition, some police employees may be inclined to smoke in stressful situations or while relaxing in a group of colleagues.

Smoking on a non-daily basis is associated with an increased risk of cancer, heart disease, and respiratory diseases [22]. It is estimated that occasional smokers, compared with never smokers, had a 72% higher all-cause mortality risk [24]. Such a high percentage of occasional smokers in this study points to an urgent need to provide anti-tobacco educational programs that would emphasize health risks arising from occasional smoking.

In this study, a marked proportion of police employees were dual users. A similar pattern of tobacco use is observed in other uniformed services, e.g., firefighters [25]. Presumably, the type of nicotine-containing products used depends on the time of the day and the social situation. Multiple nicotine-containing products use is a relatively new phenomenon. The health impact of poly-tobacco use is unknown. Social behaviors related to multiple nicotine products use as well as their impact on human health require further analysis.

Tobacco use in the workplace raises operational costs and reduces productivity [12]. Moreover, smoking in the workplace is associated with exposure to environmental tobacco smoke that is harmful to health [26]. In Poland, the number of companies introducing a smoking ban in the workplace is steadily increasing [27]. In 2009–2019, the proportion of Poles exposed to environmental tobacco smoke decreased from 25.4% to 6.7% [28]. However, further anti-tobacco activities are needed to promote smoke-free workplaces. Several practical implications emerge from this study. The proportion of occasional smokers among police em-

ployees is several times higher than in the general population. Education on the health harm of occasional smoking should be included in the national tobacco control strategy. Moreover, this study points out that e-cigarettes and heated tobacco products are gaining popularity, especially among homogeneous occupational groups. Occupational smoking cessation interventions should account for non-cigarette tobacco products. The promotion of a tobacco-free workplace should be a priority of tobacco control measures. Moreover, this study showed that multiple nicotine products use seems to be the next public health problem, and educational activities are needed to provide information about the health effects of dual or triple use of nicotine-containing products.

This study was carried out as a part of a research project on the prevalence of current and past SARS-CoV-2 infections among police employees in Poland [29]. Completing the questionnaire was obligatory to take part in laboratory tests for a SARS-CoV-2 infection because each respondent received an individual ID code for personal data after completing the questionnaire. It can be hypothesized that a relatively high response rate reported in this occupational setting may result from the study protocol and the organization of the individual stages of the study. Detailed sampling methods are presented in the previous paper [29].

This study has several limitations. Firstly, the smoking status was self-reported and was not verified biochemically [30]. Secondly, the authors focused on the prevalence of tobacco and e-cigarette use. Smoking behaviors such as the type of cigarettes smoked, the number of cigarettes per day, as well as the type of e-cigarette were not assessed. Thirdly, the occasional smokers/e-cigarette users were not inquired about the situations in which they smoked. Presumably, most of the occasional smokers were social smokers, but this observation should be addressed in further studies. Nonetheless, this is the first study on tobacco/e-cigarette use carried out in a random sample of police employees.

CONCLUSIONS

The prevalence of daily cigarette smoking among police employees was comparable to those observed in a general Polish population. However, the prevalence of daily e-cigarette use as well as heated tobacco use was higher compared to those observed in a general population. Smoking habits among police employees varied by gender, age, the health status, and the place of residence. The authors observed a marked proportion of police employees who declared occasional tobacco or e-cigarette use, and this observation requires further investigations. These observations can also be recognized as a step towards definite quitting and point to the urgent need to provide smoking cessation programs dedicated to uniformed services such as the police. A smoke-free policy addressed to police employees should include personalized and varied communication to officers and civil workers, and should educate them on the health risk of non-daily smoking.

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