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Cancer epidemiology

Alcohol availability, consumption, and knowledge of alcohol-related cancer risk among citizens of Warsaw

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Introduction. The high availability of alcohol products and low awareness of their harmful effects appear to influence individual health conditions and cancer risk.

Material and methods. We used publicly available data on alcohol retailers in Warsaw to assess the availability of alcohol products for each district of the city and the AUDIT C questionnaire to assess drinking behavior.

Results. Alcohol outlets were located within 500 meters of residence for most of the study group. We found risky alcohol consumption in about 15% of respondents. Knowledge about the harmfulness of excessive alcohol consumption had a statistically significant effect on the number of drinks consumed (p < 0.05).

Conclusions. The study confirmed the high availability and affordability of alcoholic products and the high percentage of risky alcohol behaviors among Warsaw's citizens. In addition, low awareness of the harmful effects of alcohol was associated with higher consumption, which emphasizes the need to improve educational strategies.

Key words: cancer prevention, alcohol, non-communicable diseases, alcohol retailers, primary prevention

Introduction

Alcohols are a class of organic compounds characterized by one or more hydroxyl groups (-OH) attached to a carbon atom of an alkyl group. The commonly used term "alcohol" refers to ethanol (also known as ethyl alcohol), which contains two carbon atoms. Ethanol is the form of alcohol found in beverages such as beer, wine, and liquor [1].

Alcohol is a known psychoactive substance that affects all systems in the human body and is addictive. Alcohol consumption is a contributory factor of many different health conditions, such as cardiovascular disease, cirrhosis of the liver, and some cancers. The short-term effects of alcohol consumption are usually caused by binge drinking and can lead to severe

health disorders such as injuries, violence, alcohol poisoning, risky sexual behavior, or miscarriages [2]. However, occasional alcohol consumption is also associated with numerous health complications. Moderate alcohol consumption is generally considered one drink per day for women and two for men. This model of alcohol consumption is thought to reduce alcohol-related harms [3]. The harmfulness of alcohol, its influence on various systems in the body, and its overall impact on health should be considered. Although some studies have shown that moderate alcohol consumption can positively impact human health or life expectancy [4], its negative impact on cancer risk should guide societal recommendations. According to the WHO, there is no safe limit for alcohol consumption, given

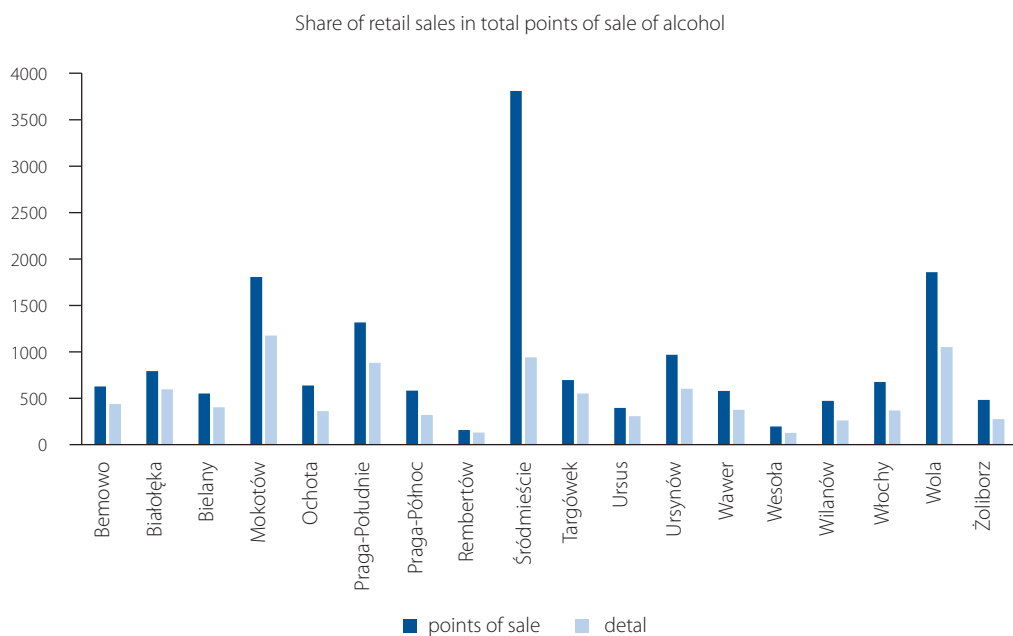Share of retail sales in total points of sale of alcohol

Figure 1. Number of alcohol sales points in Warsaw for individual districts

the increased risk of cancer [5]. So far, four main pathways for the carcinogenic effect of alcohol have been discovered. The first is related to acetaldehyde, the breakdown product of alcohol known to cause DNA damage.

Alcohol consumption is also linked to hormone imbalance, particularly harmful to women. The other mechanisms of carcinogenicity are related to alcohol-induced oxidative stress and folic acid deficiency. Of note, an association between alcohol consumption and increased risk of cancers of the gastrointestinal tract, as well as the liver, pancreas, and breast cancers, has been demonstrated. Moreover, this association appears to be dose-dependent [6]. Global alcohol consumption remains alarmingly high.

Furthermore, it is estimated that over 4% of all cancers are attributable to alcohol. Appropriate measures to reduce alcohol consumption would, therefore, likely significantly reduce the burden of cancer [7]. Given the demonstrated association between alcohol consumption and increased cancer risk, it seems warranted to examine the factors influencing alcohol consumption in larger populations and society's knowledge of the harmfulness of alcohol so as to reduce the number of preventable cancers.

Materials and methods

The study used a validated questionnaire on alcohol consumption called AUDIT C combined with original questions on awareness of the harmfulness of alcohol and its effects on cancer risk. The survey was conducted through online forums involving residents of different districts of Warsaw, Poland. In addition, the availability of alcohol outlets for each district was analyzed using publicly available information from Warsaw
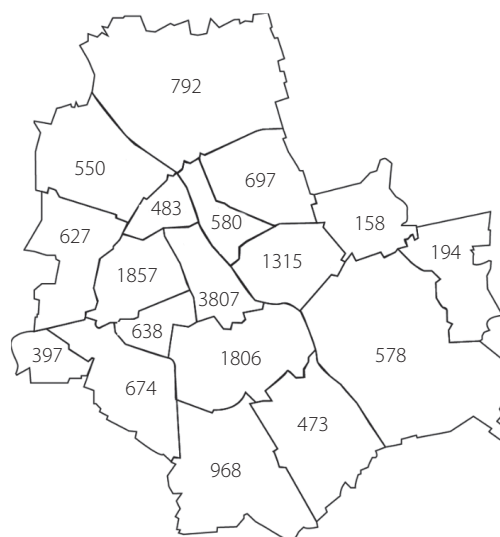
Figure 2. The share of retail sales in total points of sale of alcohol in Warsaw

City Hall. We performed statistical analyses using the IBM SPSS Statistics 27 package to test the research hypotheses. The significance level in this chapter was assumed to be α = 0.05.

Results

According to the data of the public information bulletin of Warsaw City Hall, in 2021 there were 16,594 alcohol outlets. The distribution of outlets by district is shown in figure 1. Retail licenses accounted for the largest share of permits issued for the sale of alcohol; the percentage of retail sales in the total number of alcohol outlets is shown in figure 2.

The study group consisted of 682 residents of Warsaw (524 F, 76.9%; 136 M, 20%). Most respondents were between 24 and 54 years old, had higher education, and described their financial situation as somewhat favorable. Respondents lived in the following districts:

- Bemowo – 2.8%,
- Białołęka – 4.4%,
- Bielany – 9.5%,
- Mokotów – 2.3%,
- Ochota – 0.9%,
- Praga-Południe – 31.7%,
- Praga-Północ – 1.5%,
- Rembertów – 0.9%,
- Śródmieście – 2.1%,
- Targówek – 9.7%,
- Ursus – 4.3%,
- Ursynów – 9%,
- Wawer – 1.9%,
- Wesoła – 0.1%,
- Wilanów – 0.3%,
- Włochy – 0.6%,
- Wola – 2.8%,
- Żoliborz – 12.8%

32.2% of respondents stated that the nearest alcohol outlet was located at a distance of less than 100 m from their place of residence, 48.2% of respondents said that it was located at a distance of 100 to 500 m, 11.6% of respondents answered that it was located at a distance of 501 to 1000 m, and 1.8% of respondents believed that it was located at a distance of more than 1000 m. The density of places where alcohol is sold in Warsaw is shown for each district in table I.

The relationship between the frequency of alcohol consumption and the distance of the liquor store from the place of residence was analyzed. We performed a chi-square analysis for cross-tabulation to test the hypothesis that the frequency of alcohol consumption depends on the distance of the liquor store from the place of residence (H1). The results are shown in table II.

The analysis revealed an insignificant relationship between the frequency of alcohol consumption and the distance of the liquor store from the place of residence.

The next step was to analyze the association between the availability of 24-hour liquor stores and the degree of alcohol use disorder using the chi-square analysis for the cross-tabulations. The study was conducted to test the hypothesis that greater availability of alcohol stores near a residence is

Table I. Density of points of sale (POS) per km^2 for districts of Warsaw

District	Area (km^2)	Number of residents	Population density (per km^2)	Number of POS	Number of POS – detal	Density (POS/km^2)
Bemowo	24.95	125,270	5021	627	437	25.13026
Białołęka	73.04	132,281	1811	792	597	10.84337
Bielany	32.34	130,848	4046	550	403	17.0068
Mokotów	35.42	217,424	6138	1806	1175	50.98814
Ochota	9.72	82,018	8438	638	360	65.63786
Praga-Południe	22.38	180,066	8046	1315	881	58.75782
Praga-Północ	11.42	63,442	5609	580	321	50.78809
Rembertów	19.3	24,679	1279	158	130	8.186528
Śródmieście	15.57	111,338	7151	3807	940	244.5087
Targówek	24.22	124,742	5127	697	550	28.77787
Ursus	9.36	62,399	6667	397	306	42.41453
Ursynów	43.79	151,288	3455	968	603	22.1055
Wawer	79.7	79,078	992	578	375	7.252196
Wesoła	22.94	25,926	1130	194	127	8.456844
Wilanów	36.73	43,423	1182	473	261	12.87776
Włochy	28.63	44,343	1549	674	368	23.54174
Wola	19.26	142,694	7409	1857	1052	96.41745
Żoliborz	8.47	52,907	6246	483	276	57.02479

Table II. The relationship between the frequency of alcohol consumption and the distance of the liquor store from the place of residence

How often do you drink alcohol-containing beverages?	How far is the nearest alcohol sales outlet from your residence?										χ^2	p	V_c
	below 100 m		between 100–500 m		between 501–1000 m		above 1000 m		overall				
	N	%	N	%	N	%	N	%	N	%			
never	2	1.0	4	1.6	1	1.6	0	0.0	7	1.4			
once a month	58	29.9	68	28.0	20	31.7	5	50.0	151	29.6			
2–3 a month	82	42.3	108	44.4	30	47.6	5	50.0	225	44.1	8.62	0.735	0.08
2–3 a week	35	18.0	50	20.6	9	14.3	0	0.0	94	18.4			
4 or more per week	17	8.8	13	5.3	3	4.8	0	0.0	33	6.5			
overall	194	100.0	243	100.0	63	100.0	10	100.0	510	100.0			

N – number of subjects; χ^2 – chi-square; p – value; V Cramera – effect size

Table III. Relationship between the availability of alcohol stores and the degree of alcohol use disorder

Are there any alcohol points of sale in your area open around the clock?	Risk levels associated with alcohol consumption										χ^2	p	V_c
	low-risk drinking		risky drinking		harmful drinking		suspicion of alcohol addiction		overall				
	N	%	N	%	N	%	N	%	N	%			
no	130$_a$	28.7	18$_b$	18.2	4$_{a,b}$	25.0	2$_{a,b}$	11.8	154	26.3			
yes, one	147$_a$	32.5	32$_a$	32.3	4$_a$	25.0	6$_a$	35.3	189	32.3			
yes, a few	162$_a$	35.8	42$_a$	42.4	5$_a$	31.3	8$_a$	47.1	217	37.1	17.98	0.035	0.10
yes, many	14$_a$	3.1	7$_{a,b}$	7.1	3$_b$	18.8	1$_{a,b}$	5.9	25	4.3			
overall	453	100.0	99	100.0	16	100.0	17	100.0	585	100.0			

N – number of subjects; χ^2 – chi-square; p-value; V Cramera – effect size; each subscript letter represents a subset of the severity of alcohol use disorder with column ratios that do not differ significantly by a level of 0.05

associated with a higher percentage of risky alcohol use. The results are presented in table III.

There was a significant association between the availability of alcohol stores and the extent of alcohol use disorder. However, the strength of this effect was weak. We performed additional post hoc analyzes to examine the exact differences (results are shown in the captions of table III). It was found that most individuals who did not have access to alcohol stores that were open around the clock were at low risk of suffering from alcohol use disorder. However, of those individuals with access to many alcohol stores around the clock, most were also at low risk of alcohol use disorder.

We performed a chi-square analysis for the cross-tabulation to test the hypothesis that awareness of the harmfulness of alcohol reduces alcohol use. The results are shown in table IV.

A significant relationship was found between the awareness of the harmfulness of alcohol and the frequency of alcohol consumption (p < 0.05). The strength of this effect is weak. We performed additional post hoc analyses to check the exact differences (the results are presented in the captions of table IV). It found that most people who said that any amount of alcohol was harmful to the body drank once a month or less than two or three times a week. Additionally, most people who believed it possible to take four standard servings a day without health risks, regardless of gender, drank two or more times a week or two or three times a month.

In the next step, we checked if the availability of 24-hour alcoholic stores causes higher monthly expenses on alcohol among the inhabitants of Warsaw. The results are presented in table V.

The relationship between the availability of alcohol stores and the amount of money spent on buying alcohol was insignificant.

Discussion

The availability of alcohol significantly impacts alcohol consumption, and many policies aim to reduce access to alcoholic products [8]. According to Shrek A. et al., reduced availability of alcohol leads to lower per capita consumption, with a focus on takeaway alcohol products [9]. In addition, data from the International Alcohol Control Study by Grey-Philip et al. have shown that most alcohol consumed in Europe is essentially takeaway products [10].

Table IV. The relationship between the awareness of the harmfulness of alcohol and the frequency of alcohol consumption

How much alcohol do you think can be consumed without health risks?	How often do you drink alcoholic beverages?											overall		χ^2	p	V_c
	never		once a month or less		2–3 per month		2–3 per week		4 or more per week			overall				
	N	%	N	%	N	%	N	%	N	%	N	%				
any amount of alcohol is harmful to the body	4 a, b	57.1	107 b	69.9	135 a, b	58.4	48 a	51.1	15 a, b	45.5	309	0.597				
one portion per day	3 a	42.9	32 a	20.9	65 a	28.1	28 a	29.8	8 a	24.2	136	0.263				
two portions per day for females and 4 for male	0 a	0.0	10 a	6.5	30 a	13.0	13 a	13.8	7 a	21.2	60	0.116		28.68	0.004	0.14
four portions per day	0 a, b	0.0	4 a, b	2.6	1 b	0.4	5 a	5.3	3 a	9.1	13	0.025				
overall	7	100.0	153	100.0	231	100.0	94	100.0	33	100.0	518	1.000				

N – number of subjects; χ^2 – chi-square; p – value; V Cramera – effect size; each subscript letter represents a subset of the question: How often do you drink alcoholic drinks, the proportions of which do not differ significantly from each other at the level of 0.05

Table V. The relationship between the availability of alcohol stores and the amount of money spent on buying alcohol

Are there any 24-hour alcohol points of sale in your area open around the clock?	How much money do you spend on alcohol monthly?								overall		χ^2	p	V_c
	up to 20 PLN		between 21 –50 PLN		between 51–100 PLN		above 100 PLN			overall			
	N	%	N	%	N	%	N	%	N	%			
no	47	27.3	41	27.5	23	23.2	24	26.7	135	26.5			
yes, one	60	34.9	49	32.9	33	33.3	27	30.0	169	33.1			
yes, a few	63	36.6	53	35.6	35	35.4	33	36.7	184	36.1	9.38	0.403	0.08
yes, many	2	1.2	6	4.0	8	8.1	6	6.7	22	4.3			
overall	172	100	149	100.0	99	100.0	90	100.0	510	100.0			

N – number of subjects; χ^2 – chi-square; p – value; V Cramera – effect size

At the same time, the COVID-19 pandemic showed that the reduced availability of alcohol products in bars or restaurants had no effect on alcohol consumption, which was increasing in most European countries at that time. This finding suggests that takeaway alcohol products and 24-hour alcohol stores may have a more significant share of alcohol consumption than places usually associated with alcohol consumption [11–14].

However, according to our data, neither the frequency nor the total amount of alcohol consumed depended on the availability of alcohol stores near the residence. This finding probably suggests that the frequency of alcohol consumption is more likely to be influenced by other individual, environmental, or social factors, such as personal vulnerability to addiction or stress coping strategies [15–17]. It has also been suggested that shortening the hours of alcohol sales may reduce alcohol consumption [18–20]. In the study by Hahn R.A. et al., it was recommended that prohibiting the extension of alcohol sales hours by 2 hours or more prevents alcohol-related harms, while interventions that reduce sales hours in local alcohol outlets by 2 hours or more may be an effective alcohol prevention strategy [21]. This statement contrasts with the results of our study, which found that the availability of 24-hour alcohol outlets close to home did not affect the frequency and quantity of alcohol consumption.

Similarly, the presence of these outlets was found not to affect the amount of money spent on alcohol. According to our data, a factor that probably influences the amount of alcohol consumption is awareness of its adverse effects on health and cancer risk. In general, understanding the potential carcinogenic effects of alcohol is insufficient in European countries, and according to Scheideler et al., alcohol consumption is too rarely associated with a significant risk factor of cancer, and more decisive measures are needed to increase awareness [22]. As confirmed by the results of our study, individuals who were informed that each dose of alcohol increases the risk of disease statistically drank less alcohol than individuals who were unaware. Social awareness of the increased risk of cancer is expected to lead to lower alcohol consumption, justifying educational and information campaigns on this topic.

These findings are consistent with the conclusions of the Weerasinghe et al. study, which found that understanding the link between alcohol and cancer risk would improve public support for alcohol policies such as higher prices [23].

Considering that cancer is a significant public health threat and alcohol is a recognized carcinogen, alcohol advertising bans and improving health literacy regarding alcohol's harmfulness seem necessary [24]. However, implementing

harm-reduction strategies may be currently more complicated due to new sources of exposure to alcohol advertising (social media), the attitudes of adolescents and young adults toward alcohol, and post-pandemic changes in stress-coping strategies among society.

There is also a problem of underestimating alcohol consumption that is frequently highlighted in the literature. According to Boniface S. et al., the underestimation of alcohol consumption is widespread among groups of heavy drinkers [25], which means that data from studies on alcohol consumption may be seriously distorted. Therefore we may conclude that alcohol consumption is an avoidable cancer risk factor that requires intensified action by policymakers, including increasing awareness and limiting exposure to alcohol advertisements and availability so as to protect future generations.

Conclusions

Awareness that alcohol is a defined carcinogen is insufficient among the citizens of Warsaw, Poland. In addition, health literacy regarding the harm caused by alcohol may influence alcohol consumption. Therefore, educational campaigns and other policy interventions must be emphasized to improve individuals' knowledge of alcohol-related harm, significantly decreasing cancer risk.

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