ORIGINAL ARTICLE

ASSESSMENT OF COFFEE, TEA AND HERBAL INFUSIONS CONSUMPTION IN ADULTS

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ABSTRACT

Introduction. Coffee and tea are some of the most popular beverages in the world. Herbal infusions are also growing in popularity. Much attention is being paid to the effects of these beverages on the body and human health.

Objective. The aim of the study was to analyse the consumption of coffee, tea and herbal infusions in terms of selected socioeconomic and lifestyle factors, as well as the frequency of beverages consumption in the study group.

Materials and methods. The study involved 508 adult respondents, including 404 females and 104 males aged over 18 years. An online survey questionnaire was used, consisting of questions on socioeconomic data, lifestyle, height and weight, and frequency of consumption of coffee, tea and herbal infusions. Statistical analysis of the results was performed using Statistica 13.3 software, and statistical significance was assumed at the $p \leq 0.05$ level.

Results. The beverages most often consumed by the adults was tea (90.2% of the respondents), followed by coffee (81.5%), the least frequently chosen beverage was herbal infusion (48%). The largest percentage of adults consuming coffee were: persons aged 18-29 ($p=0.012$), with higher education ($p=0.010$), living in cities over 500,000 inhabitants ($p=0.048$) or having permanent employment ($p<0.001$). In the case of tea consumption, significantly the largest percentage of adults concerned: women ($p<0.001$), persons with low physical activity ($p=0.003$) or good/very good self-dietary assessment ($p<0.001$). Significantly the largest percentage of adults consuming herbal infusions were: women ($p<0.001$), persons aged 18-29 ($p=0.031$) or with higher education ($p<0.001$). Gender was not a factor differentiating the frequency of consumption of the analyzed beverages in study group.

Conclusions. The consumption of coffee, tea and herbal infusions is determined by several socio-demographic factors. Coffee was chosen more often by young people with an active professional life in large cities, which is probably related to the availability of this beverage in offices as well as in takeaway cafes.

Key words: *adults, coffee, tea, herbal infusions, socioeconomic factors, lifestyle, frequency of consumption*

INTRODUCTION

Coffee and tea are among the most popular beverages consumed worldwide by people of all ages. They are valued primarily for their taste and aroma, but also for the wealth of active ingredients that have a positive effect on the human body. In many regions of the world, the popularity of herbal infusions is also growing, which may be influenced by the constantly growing offer of herbal products with various health-promoting properties.

Currently, coffee cultivation is concentrated mainly in the so-called coffee belt that stretches between the Tropic of Cancer and the Tropic of Capricorn. The main producers of coffee are countries such as Brazil, Colombia and Vietnam, which together provide more than half of the world's production of this raw material [30]. Of the 100 known species of the genus *Coffea, Coffea arabica L.* (Arabica coffee) and *Coffea canephora P.* (Robusta coffee) are the two most important commercial species. In terms of the assessment of the quality profile, arabica stands out and is responsible for over 70 percent of the world's coffee production. Arabica coffee is characterized by a delicate taste and contains almost twice as much caffeine as robusta. Robusta, on the other hand, is distinguished by its intense and strong taste, and according to scientific sources, it is more resistant to diseases during cultivation. The unique taste and aroma of arabica is also due to the higher content of valuable ingredients compared to robusta [1]. Coffee contains about 900 different substances that affect its health-promoting properties. In addition to the well-known caffeine, coffee also contains organic acids, essential oils, phenolic compounds and vitamins [8]. Coffee consumption can lead to various physiological

effects, such as central nervous system stimulation, increased blood pressure, increased metabolism, and increased diuresis. In addition, the consumption of this beverage may have positive effects related to the risk of developing diabetes and the incidence of diabetes [17, 20]. There is also an association between higher coffee consumption and overall anti-inflammatory effects and protection against some cancers, whereby coffee acts as both a chemopreventive and chemotherapeutic agent. There is evidence that the antioxidant activity of coffee, which activates Nrf2, may be an important mechanism of action. There is also evidence that the protective effects of coffee in the gut and decreased colon cancer risk may be due to its activity as an AhR ligand. Moreover, some of the components of coffee bind the orphan nuclear receptor NR4A1 to the interactions with this receptor, and as of yet, unidentified receptors may also be important. Overall, these mechanisms, in concert with possible epigenetic pathways and the modulation of gut microbiota/microbial metabolites, contribute to the health benefits of coffee consumption [24]. Excessive single consumption of caffeine (over 750 mg/day) may cause visual disturbances, tinnitus, strong thirst, problems with falling asleep and ventricular contractions. Pregnant women should also pay attention to the amount of caffeine consumed, as it crosses the human placenta, quickly reaching similar concentrations in the fetus and mother [3]. The caffeine consumption should not exceed 200 mg per day during pregnancy [27].

The bean's origin, the roasting process, and brewing technique have a significant effect on the coffee properties [19].

There are six main types of tea: black, green, white, red, yellow and oolong. They differ in taste, aroma and properties, and this depends on different processing methods. Nevertheless, all varieties are produced from the same plant of the *Camellia* species of the tea family (*Theaceae*). In world markets, tea is commonly divided into three types depending on the fermentation process. The unfermented form is green tea, the partially fermented form are oolong tea and fermented black and red teas [11]. The fermentation of black tea takes place through an oxidation process that is catalyzed by the enzyme polyphenol oxidase. On the other hand, red or Pu-Erh tea are obtained by fermentation with the participation of microorganisms [2]. Polyphenolic compounds are the basic components of tea, which are believed to have a positive effect on the human body. Polyphenols have not only antioxidant properties, but also have anti-inflammatory properties, stimulate the immune system, reduce the absorption of cholesterol in the blood prevent stroke, genital warts, and obesity and positively affect the composition of the intestinal microflora by inhibiting the growth of pathogenic bacteria. Their wide spectrum of biochemical activity,

including a strong antioxidant potential, makes tea can have a beneficial effect on many mechanisms in the human body [12, 13]. In addition to polyphenols, many other bioactive components have been identified in tea and its infusions, such as: pigments, polysaccharides, theine, alkaloids, free amino acids and saponins, and the amount of these compounds can vary greatly depending on the type of tea [26, 28, 29]. There are some scientific data show the positive effect of tea consumption on the human body [14, 16, 21].

It is estimated that there are about 130 species of herbal plants cultivated in Europe, especially in the Mediterranean countries, but also in Western and Central Europe. Herbal infusions have long been used in traditional medicine and enjoy becoming popular all over the world. Currently, in the era of globalization, regional barriers and ethnic infusions were abolished and specialty infusions became widely available. Due to the valued aromatic qualities and a number of beneficial properties, plants with healing potential are widely used in human nutrition to improve both physical and mental health [10]. Depending on the type, one part containing (flowers, leaves, branches or roots) or whole sectors (aerial parts or roots) can be used for consumption. The consumption of herbal beveragess is gaining popularity as many are rich sources of natural bioactive compounds such as alkaloids, carotenoids, coumarins, flavonoids, polyacetylenes and terpenoids [10]. Growing evidence suggests that the bioactive substances present in herbal infusions may have a variety of biological effects, including potential antibacterial, antioxidant, anti-inflammatory, anti-allergic, anti-thrombotic and vasodilating effects, as well as anti-mutagenic, anti-cancer and anti-aging effects [4]. The aim of the study was to analyse the consumption of coffee, tea and herbal infusions in terms of selected socioeconomic and lifestyle factors, as well as the frequency of beverages consumption in the study group of adults.

MATERIAL AND METHODS

Sample

The survey questionnaire was available on-line from February to May 2023 and was addressed to all persons: those who consented to participate in the study, who were over 18 years of age, willing to declare their consumption/non-consumption of coffee, tea and herbal infusions and the frequency of beverage consumption. After excluding forms incorrectly completed or with incorrect data, the final analysis of the results included the answers of 508 respondents.

Data collection

The questionnaire used was original included questions on socioeconomic data: gender, age,

education (primary/professional, secondary or higher), place of residence (village, small town up to 150,000 inhabitants, town 150,000-500,000 inhabitants or city over 500,000 inhabitants), professional status ('I work full time', I work part time/I study and I work' or 'I study') and economic status (very good/ good, average or poor), anthropometric data (body weight and height), lifestyle data: self- assessment of physical activity (low, moderate or high), sleeping/ hours a day (≤6, 7-8 or ≥9), self-assessment of health status (very poor/poor, neither poor nor good or very good/good) and self-dietary assessment (poor, neither poor nor good or very good/good), as well as questions about the frequency of consumption of coffee, tea and herbal infusions (never/less than 1 a month, 1-3 times a month, 1-2 times a week, 3-4 times a week, 5-6 times a week, 1 a day, 2 a day or 3 times a day or more). The collected anthropometric data, body mass (kg) and height (m) of the respondents, were used to calculate the Body Mass Index (BMI). The formula BMI = body weight/(height)^2 (kg/m^2) was used for the calculations and three ranges of values were adopted: <18.5 (kg/m^2) as underweight, 18.5-24.9 (kg/m^2) – normal body weight or 25.0-29.9 (kg/m^2) as overweight and ≥30.0 – obese.

Statistical analyses

The percentages of respondents were calculated, and the Pearson Chi^2 test was used for the statistical analysis. Statistical analysis of the results was performed using Statistica 13.3 software (TIBCO Software Inc., Palo Alto, California, USA). Statistical significance was assumed at p≤0.05.

RESULTS

The vast majority of the responednts were women, persons between 18 and 29 years old, with higher education and living in cities - over 500,000 inhabitants (Table 1). More than half of the respondents described the economic status of their household as very good or good, also the largest group were persons with permanent employment. Most of the adults who took part in the study were characterized a normal body weight. However, a large group of respondents was also overweight or obese.

In the study group of respondents, almost every second person declared low physical activity during the day (Table 2). Most of the respondents declared that they sleep 7-8 hours a day. However, every third respondent declared that they sleep 6 hours or less. The respondents were also asked to self-assess the health and nutrition. More than half of the respondents assessed the health and nutrition as very good or good.

Among the respondents, the highest percentage declared consumption of tea (90.2% of respondents), followed by coffee (81.5%). Herbal infusions were definitely the least popular, as their consumption was declared by 48% of respondents. Table 3 presents the

Table 1. Characteristics of the study group

Variables	Group	n	%
Total	-	508	100
Gender	Women	404	79.5
	Men	104	20.5
Age (years)	18-29	326	64.0
	30-50	140	27.5
	51+	42	8.5
Education	Primary/professional	7	1.3
	Secondary	164	32.3
	Higher	337	66.4
Place of residence	Village	103	20.3
	Small town	96	18.9
	Town	68	13.4
	City	241	47.4
Economic status	Very good &good	296	58.3
	Average	199	39.1
	Poor	13	2.6
Professional status	I work full time	206	40.5
	I work part time/I study & work	169	33.3
	I study	105	20.7
	I do not work	28	5.5
BMI (kg/m^2)	<18.5	37	7.3
	18.5-24.9	306	60.3
	25.0-29.9	158	31.0
	≥30.0	7	14

n – number of respondents; % – percentage of respondents

Table 2. Characteristics of the lifestyle of the study group (n=508)

Variables	Group	n	%
Physical activity	Low	242	47.6
	Moderate	220	43.3
	High	46	9.1
Sleeping (hours/day)	≤ 6	166	32.7
	7-8	310	61.0
	≥ 9	32	6.3
Health status	Very poor/poor	25	4.5
	Neither poor nor good	158	31.1
	Very good/good	325	64.4
Dietary assessment	Poor	64	12.6
	Neither poor nor good	171	33.7
	Very good/good	273	53.7

n – number of respondents; % – percentage of respondents

Table 3. Consumption of coffee, tea and herbal infusions in according to socioeconomic factors and lifestyle (n=508)

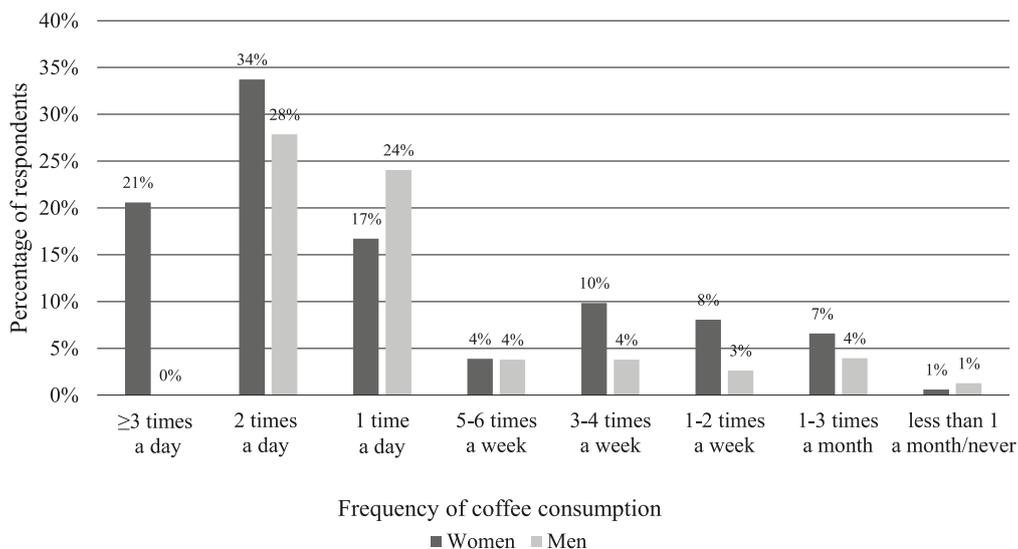| Variables	Group	Consumption of coffee n (%)			Consumption of tea n (%)			Consumption of herbal infusions n (%)		
		yes	no	p	yes	no	p	yes	no	p
Gender	Women	335 (80.9)	69 (73.4)	0.777	376 (82.1)	28 (56.0)	<0.001	216 (88.5)	188 (71.2)	<0.001
	Men	79 (19.1)	25 (26.6)		82 (17.9)	22 (44.0)		28 (11.5)	76 (28.8)	
Age (years)	18-29	256 (61.8)	70 (74.4)	0.012	291 (63.5)	35 (70.0)	0.117	137 (56.1)	189 (71.6)	0.031
	30-50	125 (29.0)	15 (16.0)		129 (28.2)	11 (22.0)		87 (35.7)	53 (20.1)	
	51+	33 (8.1)	9 (9.6)		38 (8.3)	4 (8.0)		20 (8.2)	22 (8.3)	
Education	Primary/professional	5 (1.2)	2 (2.2)	0.010	6 (1.3)	1 (2.0)	0.432	2 (0.8)	5 (1.9)	<0.001
	Secondary	121 (29.2)	43 (45.7)		143 (31.1)	21 (42.0)		62 (25.4)	102 (38.6)	
	Higher	288 (69.6)	49 (52.1)		309 (67.6)	28 (56.0)		180 (73.8)	157 (59.5)	
Place of residence	Village	83 (20.0)	20 (21.3)	0.048	92 (20.1)	11 (22.0)	0.376	45 (18.4)	58 (21.9)	0.682
	Small town	78 (18.8)	18 (19.2)		88 (19.3)	8 (16.0)		48 (19.8)	48 (18.2)	
	Town	47 (11.4)	21 (22.3)		61 (13.2)	7 (14.0)		33 (13.4)	35 (13.3)	
	City	206 (49.8)	35 (37.2)		217 (47.4)	24 (48.0)		118 (48.4)	123 (46.6)	
Professional status	I work full time	179 (43.2)	27 (28.7)	<0.001	186 (40.6)	20 (40.0)	0.456	109 (44.7)	97 (36.7)	0.378
	I work part time/I study & work	140 (33.8)	29 (30.9)		152 (33.2)	17 (34.0)		71 (29.0)	98 (37.2)	
	I study	77 (18.6)	28 (29.8)		95 (20.8)	10 (20.0)		50 (20.5)	55 (20.8)	
	I do not work	18 (4.4)	10 (10.6)		25 (5.4)	3 (6.0)		14 (5.8)	14 (5.3)	
Economic status	Very good/good	242 (58.5)	54 (57.5)	0.211	272 (59.4)	24 (48.0)	0.112	141 (57.8)	155 (58.7)	0.170
	Average	163 (39.4)	36 (38.2)		175 (38.2)	24 (48.0)		96 (39.3)	103 (39.0)	
	Poor	9 (2.1)	4 (4.3)		11 (2.4)	2 (4.0)		7 (2.9)	6 (2.3)	
Physical activity	Low	188 (45.4)	11 (11.6)	0.498	223 (48.7)	19 (38.0)	0.003	113 (46.3)	129 (48.9)	0.231
	Moderate	191 (46.1)	29 (30.9)		200 (43.7)	20 (40.0)		114 (46.7)	106 (40.1)	
	High	35 (8.5)	54 (57.5)		35 (7.6)	11 (22.0)		17 (7.0)	29 (11.0)	
Sleeping (hours/day)	≤ 6	134 (32.3)	32 (34.0)	0.377	147 (32.1)	19 (38.0)	0.356	79 (32.4)	87 (33.0)	0.444
	7-8	257 (62.1)	53 (56.4)		284 (62.0)	26 (52.0)		152 (62.3)	158 (59.8)	
	≥ 9	23 (5.6)	9 (9.6)		27 (5.9)	5 (10.0)		13 (5.3)	19 (7.2)	
Health status	Poor	20 (4.7)	5 (5.3)	0.264	21 (4.7)	4 (8.0)	0.378	11 (4.5)	14 (5.3)	0.462
	Neither poor nor good	130 (31.4)	28 (29.8)		150 (32.6)	8 (16.0)		83 (34.0)	75 (28.4)	
	Very good/good	264 (63.9)	61 (64.9)		287 (62.7)	38 (76.0)		150 (61.5)	175 (66.3)	
Dietary assessment	Poor	59 (14.2)	5 (5.4)	0.344	57 (12.5)	7 (14.0)	<0.001	28 (11.5)	36 (13.6)	0.286
	Neither poor nor good	136 (32.9)	35 (37.2)		160 (34.9)	11 (22.0)		73 (29.9)	98 (37.1)	
	Very good/good	219 (52.9)	54 (57.4)		241 (52.6)	32 (64.0)		143 (58.6)	130 (49.3)	

p-value – the Pearson Chi² test

Figure 1. Frequency of coffee consumption in the study group
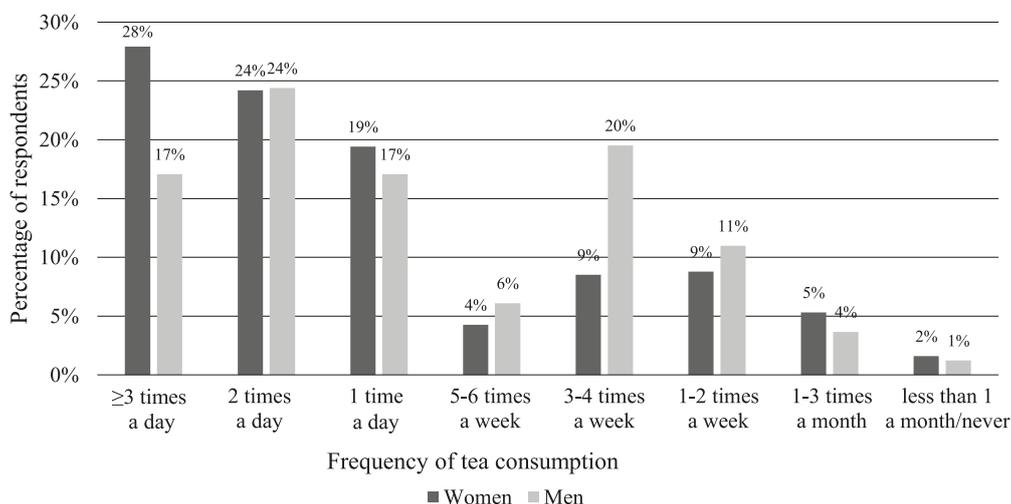

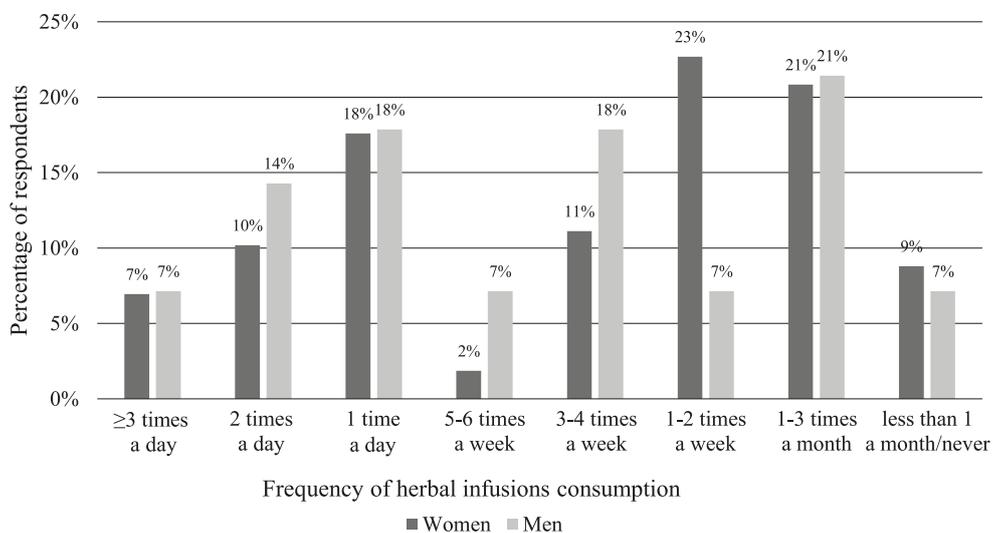Figure 2. Frequency of tea consumption in the study group

Figure 3. Frequency of herbal infusions consumption in the study group

consumption of coffee, tea and herbal infusions in terms of selected socioeconomic factors and lifestyle. In the group of respondents declaring coffee consumption, the largest percentage concerned the following persons: aged 18-29, declared higher education, living in cities with over 500,000 inhabitants or having permanent employment. In the group of participants declarated tea consumption, the highest percentage concerned women, persons declaring low physical activity or assessing diet as very good/good. On the other hand, among the respondents declaried the consumption of herbal infusions were women, persons aged 18-29 or those declaring higher education were significantly the most percentage.

The study also analyzed the frequency of consumption of selected beverages by gender (Figure 1-3). In the adults declaring coffee consumption, the largest percentage were women and men drinking this beverage 2 times a day (34% and 28%, respectively) – Figure 1. Among women declaring tea consumption, it was most often consumed with a frequency of 3 or more times a day (28%), while among men with a frequency of 2 times a day (24%) – Figure 2. On the other hand, in the group of respondents declaring the consumption of herbal infusions, the largest percentage of adults were women drinking the beverage 1-2 times a week (23%), while men 1-3 times a month (21%) – Figure 3. Analyzing the influence of the respondents' gender on the frequency of consumption of tea, coffee and herbal infusions, no statistically significant differences were found.

DISCUSSION

In this study, it was shown that the largest percentage of adults declared the consumption of tea, followed by coffee, and the least frequently consumed beverage were herbal infusions. The largest percentage of respondents consuming coffee were: persons aged 18-29, with higher education, living in cities with more than 500,000 inhabitants or having permanent employment. In the case of tea consumption, the significantly highest percentage of adults concerned: women, persons with low physical activity or good/ very good self-assessment of their diet. Significantly the largest percentage of respondents consuming herbal infusions were: women, persons aged 18-29 or with higher education. Gender was not a factor differentiating the frequency of consumption of the analyzed beverages. In the literature, could find many studies on the analysis of coffee and tea consumption, but there are fewer studies that relate to the consumption of herbal infusions.

The *Czarniecka-Skubina* et al study [5] involving 1,500 respondents aged 18-65, residents of cities with a diverse population, it was found that all study participants declared drinking coffee, which was a higher result compared to our study. Most of the respondents (76.8%) consumed coffee every day, once, twice or several times a day. Similar to the results of this study, the authors also found no significant effect of gender on the frequency of coffee consumption [5]. Another study that partially confirmed the results of this study was conducted among 5,146 participants over 20 years of age [18]. The authors also proved that coffee consumption was also associated with the younger age of the respondents, higher education and professional activity. Similar to our results, the study by *Kaniewska* et al. [15] also showed that gender was not a differentiating factor in the frequency of coffee consumption. In the study *Seidler* et al. [25] which analyzed the frequency of coffee consumption among 126 students, a higher percentage of women and a lower percentage of men concerning coffee consumption with a frequency of 1-2 times a day were found compared to the results of this study.

A lower result regarding the percentage of persons consuming tea was obtained in the study *Drywień* et al. [9]. The obtained results showed that 80% of the surveyed population aged 18-56, residents of large and smaller cities, consumed black tea, while 72% of the surveyed consumed green tea. Gender turned out to be a factor that had an impact on tea consumption, as in the study of these results. The authors also proved a higher percentage of persons consuming black tea every day - 39% of the respondents, and the influence of gender on the frequency of drinking this beverage. In the studies *Drywień* et al. [9] and *Dmowski* et al. [7, 8], the majority of respondents declared drinking at least one cup of tea a day. Also in the study *Rusinek-Prystupa* and *Samolińska* [23], the results indicated frequent consumption of this beverage and the largest group were respondents drinking 2-3 cups of tea a day, which indicates a similar frequency of tea consumption in this study. On the other hand, in the study *Czarniecka-Skubina* et al. [6], which involved 1,700 persons aged 18-75, inhabitants of rural areas and small and large cities, a higher percentage of persons consuming tea was found, because consumption of this beverage was declared by all respondents, but as it turned out, not with such a high frequency compared to the present results. Contrary to their own results, the authors in this study also confirmed the influence of gender on tea consumption. On the other hand, in the study *Micek* et al. [18], it was found that high tea consumption was not related to gender, but was associated with older age, professional inactivity and low level of education. In the study *Seidler* et al. [25], which analyzed the frequency of tea consumption among students, a lower percentage of women and a slightly higher percentage of men referring to coffee consumption 1-2 times a day was found in relation to

the results of this study. Contrary to our own results, the study *Kaniewska* et al. [15] showed that gender was a differentiating factor in the frequency of coffee consumption.

Herbal infusions were the least analyzed group of beverages in the literature. They are less popular than coffee and tea, but the market for these beverages has been growing steadily in recent years. The study *Czarniecka-Skubina* et al. [5] showed that herbal infusions were consumed 1-3 times a month, which is consistent with the frequency of consumption of this beverage in men in this study. On the other hand, in the study *Rocha* et al. [22], participants declared regular consumption of herbal infusions once a week. Only 27.2% of the respondents drank herbal infusions once or several times a day, which significantly differs from the own results.

CONCLUSIONS

The consumption of coffee, tea and herbal infusions is determined by several socio-demographic factors. Coffee was chosen more often by young people with an active professional life in large cities, which is probably related to the availability of this beverage in offices as well as in takeaway cafes. In this case, it would be advisable to conduct in-depth research to determine the motives and amount of coffee consumed in this group.

The obtained results may be an impulse to conduct research aimed at determining the amount of consumption of particular types of coffees, teas and herbs in specific groups of people.

Conflict of interest
The authors declare that there are no conflict of interest regarding the publication of this paper.

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