ALCOHOL CONSUMPTION IN POPULATION AGED 25–65 YEARS LIVING IN THE METROPOLIS OF SOUTH MORAVIA, CZECH REPUBLIC

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SUMMARY

Objective: The aim of the study was to evaluate alcohol consumption in a representative sample of the population of the city of Brno, as part of research on cardiovascular risk factors.

Methods: Cross-sectional survey on a sample of 2,160 randomly selected residents 35–65 years old was carried out. For the invited volunteers who became a part of the investigation, alcohol consumption was determined in a controlled, face to face interview structured in accordance with a special questionnaire form. The frequency of alcohol consumption during the previous year was determined, in more detail during the last month (including quantification using "units of alcohol", their normal and maximum level of drinking, and any association between alcohol consumption and meals), and during the last week in the form of a complete, beverage specified and quantified 7-day recall period. Typical patterns of alcohol consumption were explored by the means of cluster analysis.

Results: During the past 12 months, 90.0% of the men and 79.0% of the women had consumed alcohol, the rest can be considered abstinent. The most commonly reported frequency was 2–4 times per week (35.6% of the men), or 1–3 times per month (22.8% of the women). Daily or almost daily consumption was reported by 24.8% of the men and 12.8% of the women. The number of units of alcohol consumed usually on one occasion amounts to an average of 3.88 ± 4.80 for the men and 2.25 ± 1.39 for the women, but the amount most often cited by both sexes was 2 drinks (36.4% of the men and 40.4% of the women). The largest amount consumed on any occasion during the last 30 days was 5 or more units in 69.3% of the men, and in 33.9% of the women it was 4 or more units (this amount of alcohol leads to a blood alcohol concentration (BAC) of 0.08, the border of drunkenness). In 19.9% of the men and 7.5% of the women, this border was exceeded more than 5 times in the past month. Only 14.7% of the men and 10.3% of the women reported that the majority of their alcohol consumption occurs with food; on the contrary, 64.3% of the men and 77.6% of the women drinkers drink it either always without food or only rarely with it. During the past week, 81.6% of the men and 63.4% of the women drank alcohol ($p < 0.001$, chi-square). The average value of consumption for one man was 11.57 ± 11.91 doses, and for one woman 4.68 ± 6.38 doses per week ($p < 0.001$, t-test). A total of 17.8% of the men exceeded the limit of 21 doses per week, and 7.4% of the women exceeded 14 doses/week. After converting the weekly consumption into the number of units of alcohol per week expressed in litres per year, the total average consumption was 5.01 ± 6.36 litres; for the men 7.26 ± 7.62 litres and for the women 3.02 ± 4.08 litres of pure alcohol per person annually. Consumption during the week was not uniform ($p < 0.001$, ANOVA), with the highest occurring on Saturday, followed by Friday. The men mostly drank beer (62.9% of the total volume of alcohol), the women wine (68.6%). The cluster analysis identified 5 clusters of respondents, based on a set of alcohol consumption variables, as follows: very heavy drinking (1.6% of the respondents who drink alcohol); heavy drinking (8.8%); binge drinking (6.3%); moderate drinking (31.1%); and occasional drinking (52.3%).

Conclusions: The results show a relatively high consumption of alcohol in the examined group. The recommended weekly limits were exceeded by only a small portion, but that consumption had a binge character. Conversion into a form allowing comparison with conventional national statistics shows a significantly lower consumption than these reported statements. Overall, men consume significantly more alcohol than women.

INTRODUCTION

Alcohol is one of the major negative determinants of health today. According to the WHO (1), it causes more than 200 different health problems, including the most difficult and hardest-to-treat diseases. In 2012, alcohol was responsible for 3.3 million deaths worldwide, representing 5.9% of global mortality. There are significant gender differences in the proportion of deaths attributed to the influence of alcohol, accounting for 7.6% in men and 4.0% in women. There are also large geographical differences, with the

European region reporting the highest proportion of mortality attributed to alcohol (1).

Alcohol consumption in the Czech Republic has long been among the highest in Europe and the world (2, 3). There is high tolerance towards alcohol consumption throughout society. Many medical doctors, including leading experts, sometimes defend moderate consumption in the media, and even recommend it as a suitable way of maintaining good health, especially in cardiovascular terms. In this situation, determining the current consumption of alcohol should be included in any epidemiological study dealing comprehensively with the lifestyle of the population, especially in a large cardiovascular project Cardiovision 2030 focused on describing cardiovascular risks and protective lifestyle factors, as well as clinical factors, and on preventing cardiovascular diseases. The aim of this article is to describe alcohol consumption and its character within the examined group.

MATERIALS AND METHODS

The research was conducted as part of the project Cardiovision 2030, whose primary objective is to determine the prevalence of major cardiovascular risk factors in the population of the city of Brno, which has approximately 370,000 inhabitants, with an age sample of 25–65 years old. It was organized as a community-based, cross-sectional survey.

Sample

Randomly selected sample comprised 2,160 inhabitants aged 25–65 years, with a proportional representation of gender and age groups. The random selection was conducted in collaboration with the General Health Insurance Company, which owns a register of all persons insured by all health insurance companies. The condition for inclusion was Czech citizenship, permanent residence in the district of metropolitan Brno, and age in the range of 25–65 years. The insurance company contacted the selected individuals by letter, and where the response was positive, arranged a date for them to meet the research team. The investigation was initiated in January 2013. The response rate was 36%.

Methods

The study participants arrived for the survey. In addition to alcohol consumption, other lifestyle parameters, demographic data, and a detailed personal medical history were documented. An extensive clinical examination was also conducted. Alcohol consumption was assessed by means of a guided interview, structured according to a questionnaire form. The questionnaire was developed primarily for the Cardiovision project, with more general usage expected in other epidemiological projects. We developed it based in general on the most widely used methodologies, on the specific experiences of other researchers, on our own long experience, particularly in terms of quantifying amounts using a system of units (4), and also on specific questionnaires and their individual questions, in this sense, particularly the questionnaire WHO – STEPS (5). The result is a quite complex but very compact tool that combines multiple approaches, namely simple frequency, as well as weekly recall, and individual follow-up

questions aimed at identifying the overall drinking pattern: how often it occurs over time (regularity – irregularity), detecting binge drinking, determining episodes of maximum intake, and to some extent even the context of drinking, in particular with regard to food. The questionnaire consists of seven main questions, where the seventh question is in fact a detailed weekly recall. Their specific wording is as follows:

- Over the past 12 months, how often have you had any drink containing alcohol? (Frequency scale of 10, ranging from "not at all" to "6 or more times a day").
- During the past 30 days, on how many occasions you had at least one glass of an alcoholic beverage?
- During the past 30 days, when you drank alcohol, how many standard doses of alcohol did you drink on average on one occasion?
- During the past 30 days, what was the largest number of standard doses of alcohol you drank on one occasion, counting all types of alcoholic drinks together?
- During the past 30 days, how many times did you drink: men, 5 or more; women, 4 or more standard doses (glasses) of alcohol on one occasion?
- During the past 30 days, if you drank an alcoholic beverage, how often was it with meals? (Never with meals; rarely with meals; sometimes with meals; usually with meals).
- During the past 7 days, how many standard doses of alcohol did you have on individual days? For each day of the week indicate separately the number of doses for different types of drinks: beer, wine, vermouth (dessert wines, aperitifs), spirits.

The questionnaire includes a detailed specification of one dose – equivalent of 10 g of ethanol.

Validity and Reliability of the Questionnaire

The questionnaire items were based on face validity and coverage of relevant conceptual areas of alcohol consumption. The validity and reliability of the instrument was preliminary evaluated in a pilot study on a sample of 125 medicine students (56% females, mean age 22.7 years). The responses to individual questions were assessed separately, there was no total score calculated. Therefore, the reliability as internal consistency could not be estimated. The test-retest reliability was evaluated for individual items with 28-day interval between the two measurements. The correlations between the item scores ranged from $r = 0.41$ (item 4) to 0.92 (item 1); the median correlation was 0.74. The overall test-retest reliability was good considering the fact that the responses at each measurement point were related to different time periods, and the results indicate that the instrument captured the general alcohol consumption pattern. At the first measurement point, the self-report version of the Alcohol Use Disorders Identification Test (AUDIT) questionnaire was administered together with our questionnaire to assess the concurrent validity of the items. The reliability and validity of AUDIT have been established in a variety of settings and cultures (6). There were strong correlations ($r = 0.92$ and $r = 0.73$, respectively) between item 1 (drinking frequency in the last 12 months) and item 2 (drinking frequency in the last 30 days) of our questionnaire and the AUDIT item 1 (general drinking frequency). Also, there were relatively high correlations ($r = 0.50$ and $r = 0.56$, respectively) between item 4 (largest number of standard doses per occasion in the past 30

days) and item 5 (number of occasions with excessive drinking in the past 30 days) of our questionnaire and the AUDIT item 3 (How often do you have 6 or more drinks on one occasion?). Moderate yet statistically significant correlations were found for all items of our questionnaire (except for item 6) with the AUDIT total score.

Data Processing and Evaluation

The first six items of the questionnaire were processed using completely normal means. Each item represents one variable. Only variables 1 and 6 are categorical, the others are continuous – numeric. The continuous variables can then be transformed into categorical ones, which usually provide even clearer results. For the 7th question (weekly recall), the basically determined variable is represented by a given type of drink consumed on a given day, expressed in the number of units of alcohol. The totals were then expressed as: weekly consumption (in number of doses) for each type of drink; total weekly consumption of alcohol; and consumption on individual days of the week. Because one dose equals 10 g of ethanol, it was possible to give the weekly consumption likewise in grams when multiplied by ten. Since national statistics usually report annual consumption in litres per person, it was necessary to multiply the value in grams of ethanol/week by the annual number of weeks, and further by the number 1.267 for converting into units of volume (since the specific gravity of alcohol is 0.789 g/cm^3), to enable comparison with these figures. Finally, a cluster analysis of selected alcohol consumption variables was conducted with the aim to further explore typical patterns of alcohol use and to provide a more complex picture of alcohol consumption. The k-means clustering method was used for the following variables: alcohol drinking frequency over the past 12 months; average number of standard doses of alcohol per one drinking occasion in the last 30 days; maximum number of standard doses of alcohol per one drinking occasion in the last 30 days; number of occasions over the past 30 days when drinking more than 5 (men)/4 (women) standard doses of alcohol; number of standard doses of alcohol in the past 7 days. Subjects with zero alcohol consumption were excluded from the analysis, with resulting sample of N=1,082. All scores were standardized before entering the cluster analysis. As a validation method, we randomly split our sample and performed the cluster analysis on each half of the sample separately. The resulting typology was comparable for both subsamples.

RESULTS

Figure 1 shows the frequency of alcohol consumption during the past 12 months. Overall, the most frequently reported frequency was 2–4 times per week (particularly in the men, 35.6%), but the entire frequency spectrum was represented fairly evenly. Zero frequency was reported in 10.0% of the men and 21.0% of the women. We can consider this part of the group to be abstinent. Conversely, 18.3% of the men and 9.2% of the women reported daily consumption, and if we add a frequency of 5–6 times a week, then we can say that a daily or almost daily consumption was reported by 24.8% of the men and 12.8% of the women. Men generally report a significantly higher rate of consumption than

women (chi-square, p<0.001). In response to the question: "During the past 30 days, how many occasions were there when you had at least one glass of an alcoholic beverage?" the men reported an average of 12.48±12.30 occasions, the women 7.30±9.41 occasions (p<0.001, t-test). The men most often reported 6–15 occasions (31.3%), while the women 1–5 occasions (39.3%). It can also be said that 31.4% of the men and 15.1% of the women consumed alcohol more than half the days of the month. As the number of "standard doses" of alcohol consumed on average on one occasion (during the past 30 days), the men reported an average of 3.88±4.80 doses, the women 2.25±1.39 doses, p<0.001, t-test (the average calculated only for those people who were not abstinent). Figure 2 also shows that the most commonly reported amounts were 2 doses (34.6% of the men and 40.4% of the women). However, a significant proportion of the men (21.3%), shows more than twice the consumption, i.e. more than 4 doses. Concerning the largest amount of alcohol consumed on one occasion during the past 30 days, the men reported an average of 7.27±6.31 doses, the women 3.76±2.69 doses (p<0.001, t-test). Figure 3 further confirms that 69.3% of the men reported consuming 5 or more doses. This amount results on average in a blood concentration of ethanol of 0.08 blood alcohol concentration (BAC) in the men, which is considered the border of intoxication and health risks (7–10), and 32% of the men even reported
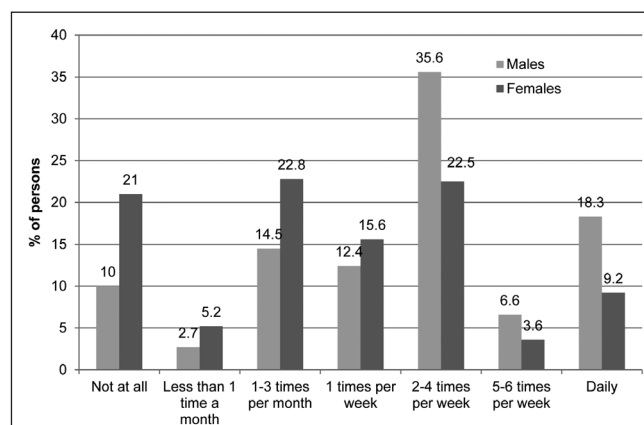

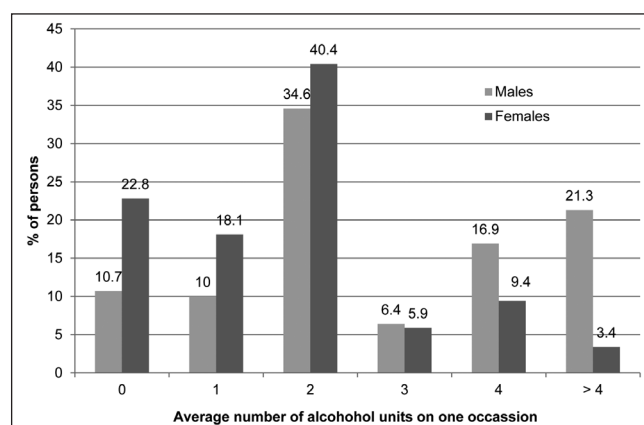***Fig. 1.*** *Frequency of the alcohol consumption during the last 12 months (N=2,160).*

Fig. 2. *Over the past 30 days, if you drank alcohol, how many units of alcohol you drank on average on one occassion?*

drinking more than double the dose. For women, 4 doses are considered the amount approaching drunkenness, and this or greater amount drunk on one occasion during the past month was reported by 33.9% of the women of the whole group surveyed. This factor was also touched upon by another question, detecting the frequency of drinking 5 or more doses by the men and 4 or more doses by the women on one occasion during the past 30 days. The men reported an average frequency of 3.40 ± 7.12, the women 1.13 ± 3.56 ($p < 0.001$, t-test). As shown in Figure 4, these limits were exceeded at least once during the past month

for 55.5% of the men and 34.2% of the women, but insignificant 19.9% of the men (and 7.5% of the women) exceeded it more than 5 times. When assessing drinking patterns in relation to food (Figure 5), we found that only a small portion of drinkers (14.7% of the men and 10.3% of the women) reported their prevailing consumption of alcohol with food, i.e. as a desirable option. Conversely, 64.3% of the men and 77.6% of the women either always drink it without food, or rarely with it. Drinking alcohol in the past week was reported by 81.6% of the men and 63.4% of the women ($p < 0.001$, chi-square). The weekly recall and number of reported consumption allowed us to determine the average value of consumption for one man 11.57 ± 11.91 doses, and for one woman 4.68 ± 6.38 doses per week ($p < 0.001$, t-test). A more detailed breakdown of consumption is shown in Figure 6. A total of 17.8% of the men exceeded the limit of 21 doses per week, and 7.4% of the women exceeded 14 doses/week. For completeness, the highest recorded consumption amounted to 77 doses per week for the men and 49 doses/week for the women. After converting the weekly consumption into number of units of alcohol per week for expression in litres per year, the total average consumption in the group was 5.01 ± 6.36 litres; for the men 7.26 ± 7.62 litres, and for the women 3.02 ± 4.08 litres of pure alcohol per person annually. Figure 7 shows the breakdown of consumption in individual days of the week, and separately for both sexes. In both cases, the consumption on individual days was significantly different ($p < 0.001$, ANOVA). By far the highest consumption for both sexes occurred, as opposed to other days in the week, on Friday and especially Saturday. Table 1 presents the various types of
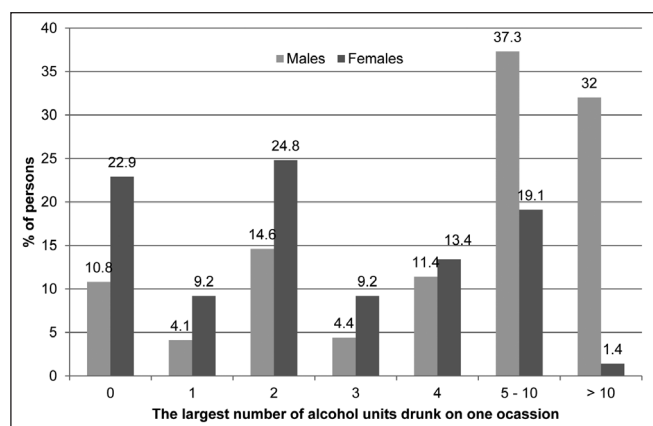

Fig. 3. *During the past 30 days, what was the largest number of alcohol units that you drank on one occasion?*
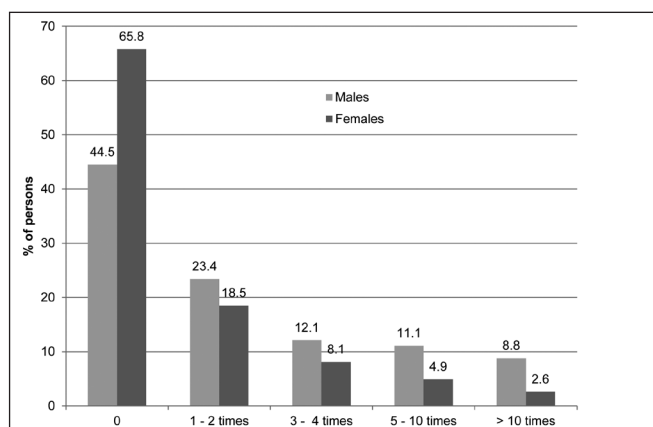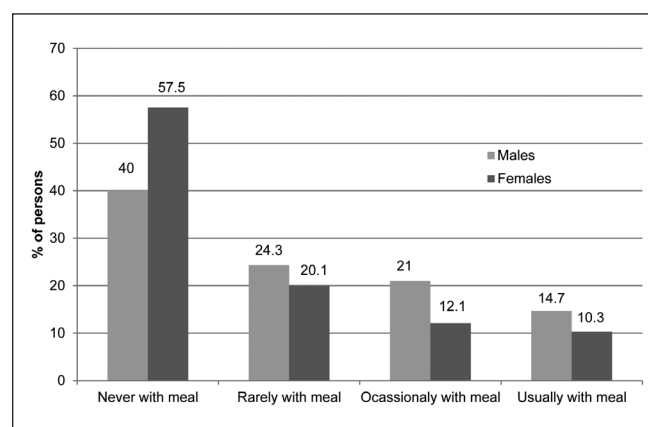

Fig. 4. *Over the past 30 days, how many times you drank: men 5 or more, women 4 or more units of alcohol on one occasion?*

Fig. 5. *Over the past 30 days, when you drank alcohol, how often was it with meals?*

Table 1. Various types of alcoholic drinks in weekly consumption (N = 2,160)

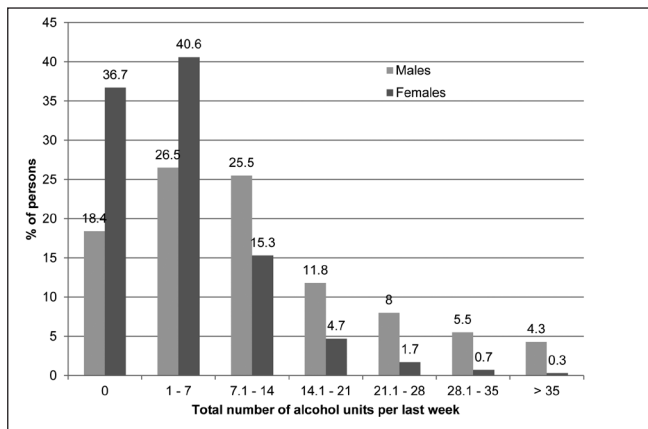|	Males Units of alcohol per week (% of total consumption)	Females Units of alcohol per week (% of total consumption)
Beer	7.28 ± 9.93 (62.9%)	1.18 ± 3.17 (25.2%)
Wine	3.40 ± 6.19 (29.4%)	3.21 ± 5.24 (68.6%)
Vermouth	0.01 ± 0.22 (0.1%)	0.03 ± 0.23 (0.6%)
Spirits	0.88 ± 2.88 (7.6%)	0.27 ± 1.27 (5.8%)
Overall	11.57 ± 11.91 (100%)	4.68 ± 6.37 (100%)

Fig. 6. The distribution of alcohol consumption in units during the past week.
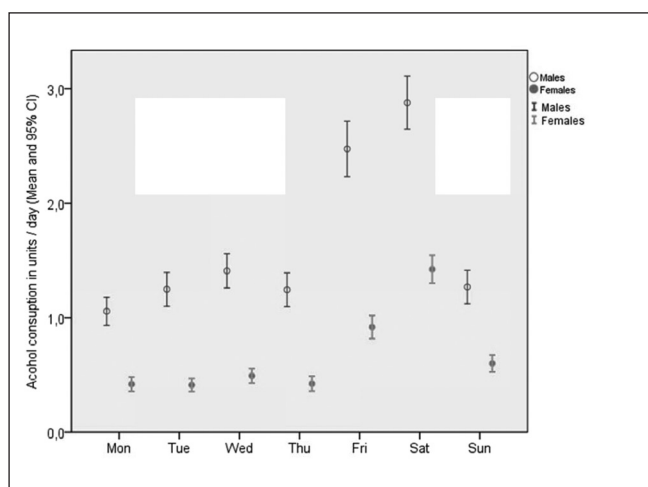

Fig. 7. Alcohol drinking on the days of the week.

alcoholic drinks in weekly consumption. It is obvious that there are large differences in the various types, and large differences between sexes. Men clearly prefer beer, while women wine. Table 2 describes how alcohol consumption depends on education, both overall and in terms of the various types of drinks. In the men, education had no demonstrable effect on their overall consumption ($p = 0.638$, ANOVA), while consumption rose in the women with higher education ($p < 0.01$, ANOVA). The average consumption for the women with basic education was 2.27 doses per week, while it was 5.37 doses for the women with university education, 2.4 times more. Regarding the effect of education on a combination of different types of alcohol, beer was more popular among individuals with lower levels of education, while the popularity of wine grows among individuals with higher education. This is true for both sexes, but particularly for women. For example, while beer constituted 46.7% of the total consumption of alcohol in women with basic education, beer accounted for 24.6% of the consumption of university graduates, contrary to 69.5% of wine consumption. The proportion of spirits was relatively low in general, most often reached on average 5–10%. Finally, with regards to the effect of age and dividing the group into 4 age categories (by 10 years), a marginally significant decrease in consumption with age occurred in the women ($p = 0.044$, ANOVA), but not in the men ($p = 0.417$, ANOVA).

Table 2. Alcohol consumption according to education

	Basic education		Vocational school (without school leaving exam)		Vocational school with school leaving exam		Secondary education		Higher vocational education		University education	
	Males (N = 14)	Females (N = 47)	Males (N = 189)	Females (N = 177)	Males (N = 19)	Females (N = 13)	Males (N = 314)	Females (N = 485)	Males (N = 17)	Females (N = 41)	Males (N = 422)	Females (N = 414)
Beer	11.60 (75.7%)	1.06 (46.7%)	8.56 (74.0%)	1.08 (31.8%)	10.97 (76.3%)	0.12 (5.7%)	7.04 (63.8%)	1.16 (23.9%)	8.08 (61.2%)	1.05 (19.3%)	6.58 (56.6%)	1.32 (24.6%)
Wine	2.86 (18.7%)	0.89 (39.2%)	2,44 (21.1%)	2.01 (59.1%)	2,94 (20.4%)	2.0 (94.3%)	2.99 (27.1%)	3.40 (70.1%)	3.71 (28.1%)	4.22 (77.6%)	4.10 (35.3%)	3.73 (69.5%)
Vermouth	0 (0%)	0.04 (1.86%)	0 (0%)	0.02 (0.6%)	0 (0%)	0 (0%)	0.02 (0.2%)	0.01 (0.2%)	0 (0%)	0.05 (0.9%)	0.01 (0.1%)	0.05 (0.9%)
Spirits	0,86 (5.6%)	0.28 (12.3%)	0.57 (4.93%)	0.29 (8.5%)	0,47 (3.3%)	0 (0%)	0.99 (9.0%)	0.28 (5.8%)	1.41 (10.7%)	0.12 (2.2%)	0.94 (8.1%)	0.27 (5.0%)
Overall	15.32 (100%)	2.27 (100%)	11.57 (100%)	3.40 (100%)	14.38 (100%)	2.12 (100%)	11.04 (100%)	4.85 (100%)	13.20 (100%)	5.44 (100%)	11.63 (100%)	5.37 (100%)

Weekly mean of alcohol units and percentage proportion of particular alcoholic beverage type on overall consumption in respective educational category
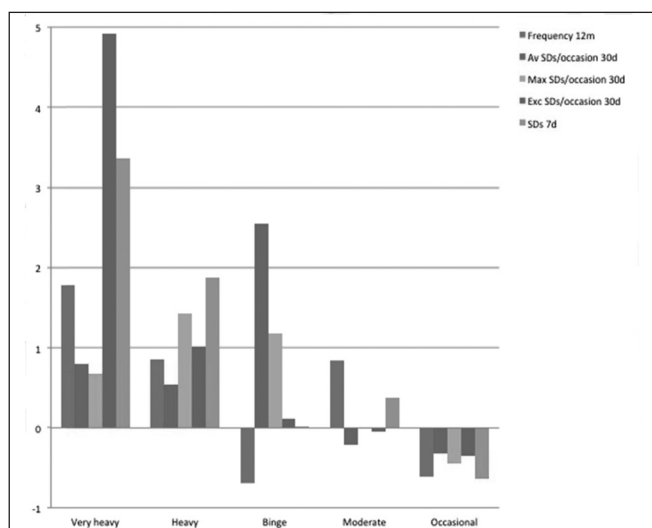
Fig. 8. Alcohol drinking patterns (cluster centres based on standardized scores).

The exploratory cluster analysis yielded 5 clusters of respondents, based on a set of alcohol consumption variables. The mean plot for the final cluster centres is presented in Figure 8. The categories of drinking patterns were named as follows: very heavy drinking; heavy drinking; binge drinking; moderate drinking; and occasional drinking. The very heavy drinking was the least frequent pattern (N=17; 1.6% of the sample of non-abstaining respondents), characterized by high scores in all included variables but particularly in number of occasions over the past 30 days when drinking more than 5 (men)/4 (women) standard doses of alcohol, number of standard doses of alcohol in the past 7 days, and the drinking frequency over the past 12 months. The respondents in the second cluster named heavy drinking (N=95; 8.8% of the sample) also reported above-average values in all variables but in comparison to the very heavy drinkers, they showed less frequent drinking, less total standard doses per the past 7 days and much less drinking occasions with excessive consumption (more than 5 (men) or 4 (women) standard doses) over the past 30 days. The binge drinking pattern (N=68; 6.3% of the sample) was mainly characterized by excessive average number of standard doses of alcohol consumed per one drinking occasion while the overall drinking frequency per the past 12 months or the number of standard doses consumed in the last 7 days were low. The moderate drinking pattern (N=336; 31.1%) meant above-average drinking frequency, comparable with heavy drinkers, but only average consumption per drinking occasion. The last cluster of occasional drinkers (N=566; 52.3%) showed low scores in all analyzed variables. There were significant differences between the clusters in the proportion of respondents' gender, marital status, educational level, and age categories (p<0.001, chi-square). Among very heavy drinkers, there were greater proportion of men, older (over 40), and married respondents. Heavy drinkers showed much greater proportion of men than women (86% vs. 14%), of younger, and divorced subjects, with higher education. Typical binge drinkers were young, less educated, single men. There were more men, highly educated and married respondents among the moderate drinkers, while the occasional drinkers were mostly women with high school education.

DISCUSSION AND CONCLUSION

There are two basic approaches for assessing the level of alcohol consumption in the population – the use of national and international statistical reports, and original research. National statistics regularly based on the consumption of 1 inhabitant per year are the easiest and most widely used sources, but their degree of accuracy is very limited since the data is not collected from individuals but from collected reports. This is necessarily fraught with the big possibility of error, and this approach can hardly characterize a specific population in detail. Moreover, it does not allow further analytical evaluations, especially in terms of connections with other individual risk factors, particularly clinical. Since our study was conducted as part of a wider project on the prevalence of cardiovascular risk factors in a representative population sample, it was necessary to use detailed individual surveys.

To determine alcohol consumption in epidemiological studies, several basic methodological approaches have gradually crystallized; each of them has its strengths, but also its weaknesses. There is no universally applicable methodology.

The conventional Quantity Frequency (QF) methods and Beverage Specific Quantity Frequency (BSQF) work very well in cases of more or less regular and particularly steady consumption. But they are criticized mainly for measuring modal values of frequency and quantity rather than averages (11). In practice, respondents report occurring values more frequently, but they do not necessarily provide a true picture of the average total quantity, especially in cases of uneven or irregular consumption. It can be very difficult for respondents then to specify an "average" normal value, and the given figure can be greatly influenced by previous consumption. This problem also relates to the length of the surveyed period – shorter periods make it easier to recall consumption, but may represent non-standard periods for those surveyed, or one period from extreme phases: abstinence or, on the contrary, binge drinking. In contrast, for longer periods the respondent may not recall a distant period with sufficient precision and so an attempt at long-term averaging can be easily distorted by a larger error.

Graduated Frequency (GF) in contrast uses a completely different approach. It asks respondents about the maximum number of drinks they had in a specified period (usually the past year). After determining the highest category of number of drinks, the respondent is asked how often they occurred. The respondent is then asked about a smaller number of drinks, how often he/she had such an amount on a single occasion. In this way, the researcher is attempting to cover the full spectrum of alcohol consumed by the respondent, beginning with the maximum amount, and proceeding down with questions about smaller and smaller amounts. GF does not usually specify the beverage. By its nature it is primarily focused on measuring volume and is especially able to cope better with irregularities. It will not miss large amounts consumed, although they may not be consumed frequently. According to comparative studies, it appears that GF indicates higher overall consumption. Midanik found that GF detected 38% more volume than the general QF (12). It is not clear, however, whether the detected higher volume is a valid result, or an artifact. There are signs that the use of GF has the consequence of overestimating the frequency of drinking, including a considerable proportion of respondents whose yearly frequency exceeded 365 days

(13–15). Other problems with GF have also been reported. In an international comparison across 10 countries, Gmel et al. (13) found problems with the implementation of GF, where in several countries the respondents responded only to the category of quantity. BSQF appeared to work better by obtaining higher volumes in most cases and was not so prone to duplication of counting frequency as GF. In summary, it seems like GF works better in lighter drinkers and in people with higher cognitive abilities, since the median of drinking is surveyed, the same as dividing the total number of days of drinking into individual levels of amount in the questionnaire. Gmel et al. (13) discovered that BSQF works better when more members of society are compared using the same tool. When developing our questionnaire, we evaluated GF and tested the suitability of its use in a certain way, but we have used an approach more attuned to BSQF in our workplace. GF did not prove useful during our pilot testing, because it seemed too difficult to understand for most respondents.

The questionnaire designed for use in our cardiovascular project combines several methodological approaches. The "measuring core" corresponds to the BSQF principle, but because of the short reference period (and the detail of the survey), it can be included among short recalls as well. The period of one week can seem too short, but it must be seen in the whole context of our application. A short reference period has the disadvantage that it does not adequately catch drinking patterns and volume, especially in moderate and infrequent drinkers (11). On the other hand, a longer period requires respondents to summarize or average their quantity and frequency of drinking. Especially with the QF method, both parameters are very likely understated, and high volumes of consumption are excluded by definition.

To some extent, the same is true for GF, but in this case the respondents are asked to recall occasions when they drank the most of alcohol during that period. Periods of one month to a year are usual for GF. In terms of actual recall and its accuracy, the week long period is optimal. Finally, short-term recalls and records are generally considered the most accurate methodology, and higher volumes are revealed compared to QF or BSQF (with longer periods), especially for those who are categorized as light drinkers (16–19). In fact, our questionnaire evaluates longer periods and detects binge drinking with other questions. Overall, a sufficiently long period during the year is covered, making it possible to clearly see the structuring of the questionnaire in a total of 3 periods – year, month and week.

In the discussion on possible approaches, one of the most important diagnostic tools for questionnaires in the field of alcohol research is the WHO questionnaire Alcohol Use Disorders Identification Test (AUDIT) (20, 21). It contains 10 questions; each of them is scored 0–4, so that the maximum possible score is 40. A shortened version is also used in clinical and research practice, AUDIT-C (22), which has only 3 questions scored the same, with a total of 12. These questionnaires, however, are especially focused on the problems associated with drinking, or resulting from it, and on the indicators of a loss of control over drinking, and are therefore more directed towards the field of addiction.

Another point of discussion in measuring the consumption of alcohol is the method for determining the volume, or even the question of using units (doses) of alcohol. The concept of a standard drink or standard dose has been used for decades throughout the world, though not all countries have adopted this concept. It essentially expresses the volume of consumed alcohol as an equivalent of a certain quantity of ethanol, but for different beverages with different alcohol contents, such an equivalent is represented by various volumes of the beverage, which should also best correspond with a quantity typically served for the given beverage. There are of course international differences in these parameters, therefore, the unit of alcohol varies in most countries between approximately 8–14 g, in Japan even 23.5 grams (10). In the US, the values 12 and 14 g are cited, in Great Britain 8–10 g, in Australia 10 g (23). In their proposal for a standardized approach (SMART) for Europe, Moskalewicz and Sieroslawski reported that given the diversity of alcoholic beverages with very different alcohol contents, usually consumed in glasses of different volumes, the application of any common measure, such as a standard drink or unit, is not attainable in Europe at all, because it could lead to serious numerical errors (23). Such a statement can only be accepted in part. It is understandable as an attempt to create a completely standardized questionnaire for use in various countries, but the question is whether the part concerning the means of determining quantity must be standardized so that it is exactly the same for all countries. The use of equivalent units of alcohol has considerable advantages compared to having to indicate (and determine) all consumption at current units of volume (ml, dl, l). It is even easier for respondents, after of course they understand the system. Questions for determining whether certain limits are exceeded can be considered universally for alcohol in general, otherwise this survey would have to deal with each beverage separately. Finally, the entire concept of GF is based on a system of equivalent drinks.

Determining the thresholds of risk is another debatable point, both for the total intake of alcohol (weekly, annually) and in terms of a single dose (meaning one occasion). In terms of the questionnaire, the second part of the problem is more pressing given that we directly ask about the frequency of crossing a certain threshold; in our case, 5 doses (50 g) in men and 4 doses (40 g) in women. This is the only question that gives such a critical threshold in advance; for the other questions, it is more a matter of later processing and particularly interpreting the results, not the wording of the questionnaire. The terms describing harmful drinking include episodic heavy drinking, binge drinking, heavy single occasion drinking, and extreme drinking. Because the average daily intake and subsequent average consumption may not adequately reflect the risks associated with certain consequences, a scale of intensive, concentrated consumption over a short period has been recognized as a critical indicator of drinking patterns (9). Such a scale is generally defined as a situation that can raise blood alcohol concentration to a level of intoxication during one occasion. This also corresponds to the definition of the term "binge drinking", especially given recent efforts to base this definition on blood concentration (10). This threshold is considered to be 0.08 BAC (7). According to the US National Institute on Alcohol Abuse and Alcoholism (NIAAA), such threshold is reached after men drink 5 standard drinks and women 4 (7). The American standard drink according to NIAAA corresponds to approximately 14 g of ethanol. If we look at different countries, the intake risk is mostly set within the range of 60–70 g of ethanol, and when measured by the number of "drinks", it is mostly set at 5+ (24). Blood alcohol content, in fact, strongly depends on several factors such as body weight, sex, body water content, and others. The

thresholds used in our questionnaire for high-risk one-off quantities, i.e. for men 5 doses (50 g of ethanol) should result in a blood value of 0.87‰ for an 80-kg man, and for women 4 doses (40 g of ethanol) should result in 0.95‰ for a 70-kg woman. We therefore believe that it suits its purpose quite well, and there is no current reason to consider decreasing or increasing it. The stated blood threshold of 0.8‰ has been equally set arbitrarily (in fact there is no clear threshold, the increase effect is described as linear), based more on behavioural effects and the signs of the onset of intoxication than on the risk of chronic damage to health in terms of increased risk of non-communicable diseases, which is our core interest and the purpose of the questionnaire. It appears that the threshold of alcohol hazards in terms of somatic damage to health and contribution to chronic illness is lower than those hazards for addiction, social implications etc. In terms of regular prolonged consumption, the health risk threshold for a healthy adult man is given (by the WHO) as a dose of 60 g/day for regular daily consumption (25). However, in terms of the risk of some specific diseases, these thresholds are much lower. Perhaps most significantly, this can be seen in cancer, wherein the upper threshold of daily intake is given to be around 30 g for men and 20 g per day for women, where an even lower consumption cannot be qualified as safe, because any alcohol intake increases the risk of cancer in some way (non-threshold effect). It is only a matter of how much of an increase we still consider bearable (26). For cardiovascular diseases, the situation is far less clear (27), and in this sense the study Cardiovision 2030 should increase our knowledge further. In case of cardiovascular diseases, not only the concept of beneficial effects of small doses is widespread, but also an increase in the risk among abstainers. However, critics warn that people abstaining from alcohol can also include so-called "ill abstainers", i.e. people who have stopped drinking alcohol for health reasons, and because they are being treated with drugs that together with alcohol result in dangerous interactions. These people will have higher cardiovascular mortality, but not because of abstinence, rather because of their overall worse health condition (28).

Reservations against studies that recommend moderate drinking do not concern only "sick abstainers", there are numerous other reasons (29–31). According to the WHO, it is right to respect and support the decision to abstain from alcohol (32). The WHO materials also state that a doctor should never advise those who abstain from alcohol to start drinking (33).

Another problem consists of addicted people with a loss of control over their drinking. They often try to abstain, but their longer periods of abstinence, lasting months, also reveal episodes of uncontrolled drinking. These people would not be identified by the questionnaire if their excesses occurred more than 30 days previously. But this is related to the overall concept of the questionnaire, as discussed above.

As already mentioned, the most widely used indicator of annual global alcohol consumption in the population is expressed in litres of pure alcohol per capita, as it appears in various national and international statistics. We compared our results with 3 main sources – data from the Czech Statistical Office (34), OECD (3), and WHO (2). For the Czech Republic in 2013 (the latest year available), the Czech Statistical Office gives a consumption of 9.8 litres of alcoholic beverages in pure ethanol. OECD gives a consumption of 11.6 litres (for 2012) and ranks the Czech Republic fifth in the world behind Estonia (12.3 litres), Austria (12.2 litres), France (12.0 litres), and Ireland (11.7 litres). The WHO gives the consumption for CZ for people over 15 years old at 12.5 litres, and also separately by gender, for men 18.6 litres (9th in the world) and for women 7.8 litres (6th in the world). If we compare this data with our results, i.e. 7.3 litres for men and 3.0 litres for women (total 5.0 litres), they are very different figures. Of course, they involve different methodological approaches, but the differences are immense, namely in the context of statistics obtained in a similar manner. The highest value comes from the WHO, which still uses a sophisticated algorithm of calculation combining multiple sources, from commercial data derived from tourist purchases, and conversely includes unrecorded consumption derived mainly from domestic distilleries. Theoretically, however, the methodology of the direct interview questionnaire used by us should be the most accurate, even though there is no guarantee that the respondents have provided truthful testimony. By its nature, alcohol carries the risk of being underestimated considerably more than other less sensitive areas of lifestyle. In addition, our results cannot be presented as representative for the Czech Republic, because they have been obtained from only one city. On the other hand, this city is the centre of southern Moravia, which is generally regarded as an area with high alcohol consumption, mainly due to the widespread wine industry. There are also differences in the structure of beverages. According to data from the Czech Statistical Office (34), the percentage of beer-wine-spirits is 51.0 : 22.4 : 26.3 (calculated according to the content of pure ethanol); according to the WHO data (2), it is 54.9 : 20.8 : 24.5. Neither of these sources makes it possible to divide this parameter by gender, but gender differences are very crucial in our sample. For the entire group, the ratio is 39.4 : 35.3 : 5.1; for the men 62.9 : 29.3 : 7.8, and for the women 25.5 : 68.1 : 6.4. Wine is indeed more represented in our sample than beer and spirits, while the preference for wine at the expense of beer is significantly stronger among women.

An evaluation in terms of alcohol consumption in litres per year is rather only a secondary product of our study, and in general the average values are able to characterize the population just a little. It rather provides important information about the distribution and nature of consumption. Although the majority of the study population regularly consumes alcohol (significantly more men), a relatively small proportion exceeded the recommended weekly limits (17.8% of the men and 7.4% of the women). At the same time, however, a relatively high proportion of respondents exceeded the recommended single limit at least once in the past month (69.3% of the men and 33.9% of the women), and in addition, a majority consumed alcohol separately from food, with binge drinking on Saturday and Friday clearly predominating. Overall, an adverse pattern of consumption clearly predominates.

Among the risks of such drinking patterns we can mention a higher risk of sudden death, stroke, coronary events, and atherosclerosis of the coronary arteries in otherwise moderate drinkers (35–38).

The actual impact on clinical health indicators such as blood chemistry values, blood pressure, blood vessel elasticity according to pulse wave velocity, intima media thickness, and cardiovascular parameters are not subject of this article, the purpose of which was rather to describe a sample group in terms of establishing a "baseline", evaluation will be the next step in the further analyses of the Cardiovision Brno 2030 project.

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