Urban-rural Differences in Alcohol Consumption and Its Relation to Mortality and Myocardial Infarction Morbidity

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In 1983–1985, 1986–1987 and 1992–1993, epidemiological surveys were carried out in Kaunas and in five rural regions among population aged 35–64 years within an international study called CINDI. The aim of the present work was to compare urban and rural populations by alcohol consumption patterns in 1992–1993 and to determine the influence of alcohol intake on nonfatal myocardial infarction (MI) and mortality risks. It was determined that regular alcohol intake was significantly more common among urban women as compared with women screened in rural region (85.5% *vs*. 78.2%). The proportion of never-drinkers both among men and women samples in rural regions was significantly higher as compared with Kaunas samples. However, alcohol consumers, both men and women, in rural regions consumed alcohol beverages not only more frequently than did urban population, but also in larger amounts. The total mortality (RR = 1.5, 95% CI 1.1–2.2) risk was higher among nondrinking men as compared with those consuming 3–5 drinks a month.

Key words: population studies, urban-rural, alcohol consumption, relative risk, mortality, morbidity, ischemic heart disease, myocardial infarction

INTRODUCTION

Many studies have shown a different prevalence of main risk factors (RFs) of chronic noncommunicable diseases, as well as in mortality and morbidity rates for those diseases, among rural and urban population (1, 2). These findings may be explained mainly by differences in age structure, socioeconomic status, and some other factors. Among the latter, alcohol consumption is one of the most prevalent. Alcohol consumption habits do differ when urban and rural populations are compared (3, 4). Many cases of traumas and accidents, some gastrointestinal disorders, cardiovascular and other diseases, sudden death may be related to chronic alcohol abuse. Several large population studies carried out during the past decade have shown a U- or J-shaped relation between alcohol intake and mortality for both men and women throughout adulthood (5–8).

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The aim of our study was to analyze the alcohol consumption habits among urban population and population of five rural regions and to determine the influence of alcohol intake on acute myocardial infarction morbidity and mortality.

METHODS

The data from the international Countrywide Integrated Noncommunicable Diseases Intervention (CINDI) study conducted in an urban population (Kaunas) and in populations of five rural regions (Kaišiadorys, Kretinga, Kupiškis, Joniškis, and Varėna) were used in this article. Epidemiological surveys among urban population aged 35–64 were conducted in 1983–1985, 1986–1987, and 1992–1993. Male and female samples from five rural regions were screened three times at approximately the same time periods as in Kaunas.

The data from the survey conducted in 1992–1993 were used in this work to compare the alcohol consumption habits in urban and rural population. During the survey 1,241 persons (612 men and 629 women) aged 35–64 years were screened in Kaunas.

A total of 1,273 persons (542 men and 731 women) aged 35–64 years were screened in five rural regions at the same time as in Kaunas.

The CINDI study samples were randomly selected from the whole Kaunas population aged 35–64 and from the whole populations of the same age in the rural regions. The samples were stratified by age and sex so that at least 200 male and 200 female would be screened in every 10-yr age group.

MI morbidity and mortality from ischemic heart disease (IHD) in relation to alcohol consumption habits was only determined in urban population. To analyze the MI morbidity and mortality among followed-up persons, data from the Kaunas IHD register were used. All nonfatal MI cases were registered from the beginning of all three surveys until January 1, 1999, and all death cases were registered until January 1, 2001. All non-fatal MI cases and all deaths from IHD were registered and verified using all possible medical documentation (hospital discharge records, domiciliary care records of outpatient departments, necropsy and medicolegal records).

Alcohol drinking habits were ascertained via questionnaires. The persons were asked about the type of alcohol beverage, frequency of consumption, and usually consumed amount of alcohol. The usual amount of alcohol intake was expressed in standard alcohol units (drinks). One drink was equal to 10 ml of pure alcohol. For different alcohol beverages this corresponded to 340 ml (beer), 132 ml (wine) or 42.6 ml (vodka or other strong spirits) (9). Number of drinks consumed per month was also calculated for every subject according to the usual frequency and amount of consumed alcohol.

Other RFs analyzed in this paper were determined according to generally accepted and standard epidemiological methods and were classified according to the WHO criteria described earlier (10).

The estimates of relative risks (RR) and their 95% confidence intervals (CI) were based on the Cox proportional hazards model (11). For evaluation of an independent effect of alcohol consumption on the occurrence of IHD, all rates of MI morbidity and mortality from IHD were adjusted by age, time of screening, and levels of other RFs.

The age structure of the whole Lithuanian population aged 35–64 was used as a standard for direct standardization of analyzed rates and mean values of parameters (coefficients for every ten-year period were as follows: 0.353 for 35–44 yrs; 0.351 for 45–54 yrs; and 0.296 for 55–64 yrs).

The χ^2 and Student statistics were used to analyse the relationship between the parameters.

RESULTS

It has been detected that as many as 92.7% of the screened men in Kaunas population and 91.7% of men in the rural population were alcohol consumers at the time of screening. The rate of female alcohol consumers was significantly lower in rural population as compared with Kaunas population (78.2% *vs*. 85.5%, p < 0.001). Only 4.9% of Kaunas men and 3.0% of men from rural areas were ex-drinkers. In the female samples, the proportion of ex-drinkers was 1.9% in rural population and 3.2% in Kaunas (p > 0.05). The rate of never-drinkers both among men and women samples (5.3% and 19.9%, respectively) in rural region was signifi-
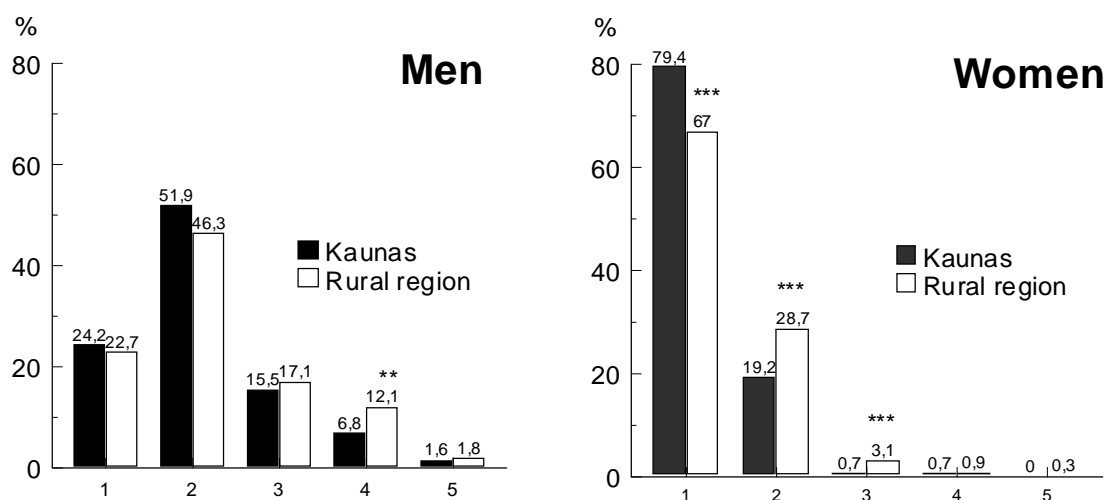

Fig. 1. Distribution of Kaunas and rural region populations according to the frequency of alcohol consumption
1 – several times a year, 2 – once or several times a month, 3 – several times a week, 4 – once a week, 5 – every day.
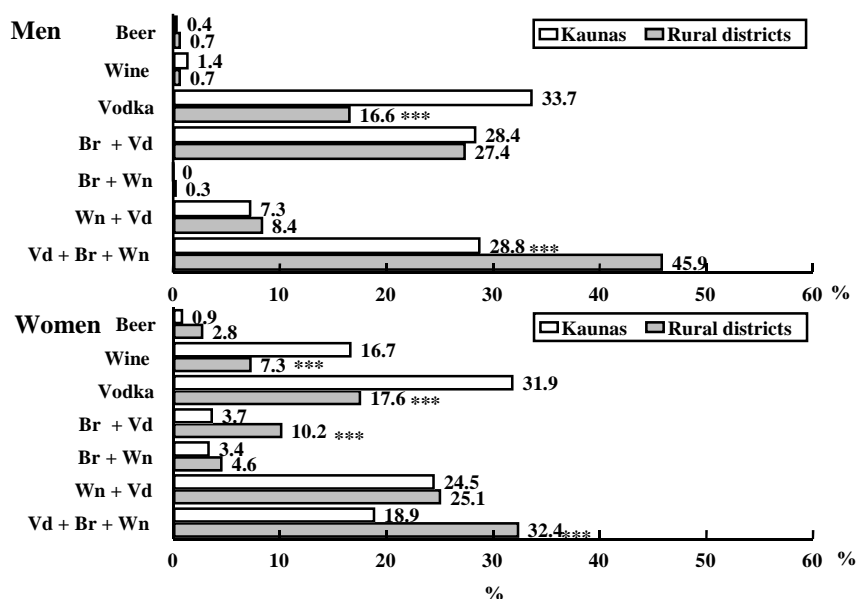
Fig. 2. Alcohol consumption pattern in Kaunas and rural region populations
Vd, vodka; **Br**, beer; **Wn**, wine.

as compared with persons from Kaunas (28.7% *vs*. 19.2%, p < < 0.001). Yet, in both female samples this group was the second largest among alcohol consumers. 12.1% of men in rural region and 6.8% of men in Kaunas (p < 0.01) consumed alcohol several times a week. The proportion of females consuming alcohol once a week was significantly higher among rural population as compared with Kaunas population (3.1 *vs*. 0.7%, p < 0.01).

As many as 33.7% of Kaunas male alcohol consumers would drink exclusively vodka (as compared with 16.6% among rural male drinkers, p < < 0.001) (Fig. 2), whereas in rural region 45.9% of drinkers stated that they drank vodka, wine, and beer with the same frequency (in Kaunas, 28.8%, p < < 0.001). The largest part of female drinkers in Kaunas consumed exclusively vodka (31.9%), while the largest part of rural female drinkers (32.4%) stated that they consumed vodka, wine, and beer with the same frequency. The proportion of wine consumers was significantly higher among the Kaunas female sample as compared with females from rural samples (16.7% *vs*. 7.3%, p < 0.001). The opposite trend was determined when the rate of drinkers consuming beer and wine with the same frequ-

cantly higher as compared with Kaunas men and women samples (2.4% and 11.3%).

The largest part of male drinkers consumed alcohol at least once a month (51.9% in Kaunas and 46.3% in rural townships) (Fig. 1), while the largest part of female drinkers would only consume alcohol several times a year (79.4% in Kaunas and 67.0% in rural samples, p < 0.001). The second largest group by frequency of alcohol consumption among men was the group consuming alcohol several times a year (22.4% in Kaunas and 22.7% in rural region). Among women, significantly more persons in rural region consumed alcohol several times a month

Table 1. **Distribution (%) of men according to consumed standard amount of alcohol (drinks) per month by age in Kaunas and rural populations**

Drinks per month	Age group			
	35–44	45–54	55–64	Standardized by age
Kaunas	N = 196	N = 191	N = 179	N = 566
< 3.0	16.3	24.6*	31.8**	23.8
3.1–5.0	9.7	11.5	14.5	11.8
5.1–10.0	21.9	22.5	27.4	23.7
10.1–20.0	21.9	16.2	10.1**	16.4
> 20.0	30.1	25.1	16.2**	24.3
Rural region	N = 126	N = 153	N = 211	N = 490
< 3.0	12.7	20.3	28.9***	20.2
3.1–5.0	12.7	11.8	8.5	11.1
5.1–10.0	12.7	15.0	25.1***	17.2+++
10.1–20.0	18.3	10.5	15.2	14.6
> 20.0	43.6+	42.4+++	22.3***	36.9+++

Statistically significant as compared with the age group 35–44 yrs: * p < 0.05, ** p < 0.01, *** p < 0.001.
+ p < 0.05, ++ p < 0.01, +++ p < 0.001, for rural *vs*. Kaunas sample comparisons.

Table 2. **Distribution (%) of women according to consumed standard amount of alcohol (drinks) per month by age in Kaunas and rural populations**

Drinks per month	Age group			
	35–44	45–54	55–64	Standardized by age
Kaunas	N = 192	N = 188	N = 155	N = 535
< 0.5	28.1	28.7	49.0***	35.5
0.6–1.0	23.4	23.9	20.0	22.6
1.1–2.0	31.8	30.3	23.9	28.9
> 2.0	16.7	17	7.1**	14.0
Rural region	N = 189	N = 199	N = 170	N = 558
< 0.5	13.2+++	18.0+	29.5***+++	19.7+++
0.6–1.0	18.1	17.6	23.5	19.5
1.1–2.0	37.6	34.1	28.2	33.6
> 2.0	31.2+++	30.2++	18.8***++	27.2+++

Statistically significant as compared with the age group 35–44 yrs: ** p < 0.01, *** p < 0.001.
+ p < 0.05, ++ p < 0.01, +++ p < 0.001, for rural *vs*. Kaunas sample comparisons.

ency was analyzed in both groups: 3.7% among Kaunas women and 10.2% among rural women, p < < 0.001.

The corresponding male and female samples from Kaunas and rural populations were compared by the amount of alcohol (expressed in drinks) consumed every month (Tables 1 and 2). The largest part of men both in Kaunas (24.3%) and in rural region (36.9%) consumed more than 20 drinks a month. The second largest part in both male samples was the group of drinkers consuming less than 3.0 drinks a month (23.8% in Kaunas and 20.2% in rural population). The proportion of men consuming small amounts of alcohol (≤ 3.0 drinks per month) increased with age, and the share of heavy consumers of alcohol (> 20 drinks) decreased with age.

The largest part, 34.5%, of Kaunas female drinkers consumed less than 0.5 drinks a month, whereas in rural region the largest part (33.6%) of drinkers was persons consuming 1.1–2.0 drinks per month. Significantly more persons in rural region, as compared with Kaunas (27.2% *vs*. 14.0%, p < 0.001), consumed large amounts of alcohol (> 2.0 drinks a month). Conversely, small amounts of alcohol were consumed by 34.5% of women in Kaunas, *versus* 19.7% in rural region (p < 0.001). Like among men, the proportion of women-consuming small amounts of alcohol (0.5 and 0.6–1.0 drinks per month) increased with age, and that of consumers of large amounts of alcohol (≥ 1.1 drink) decreased.

During the follow-up period, 120 of the initially surveyed men fell ill with acute MI

and 513 died (163 from IHD). Of 2,407 women, 45 fell ill with acute MI and 272 (63 from IHD) died.

In the analysis of the effect of alcohol intake on IHD morbidity and mortality, the 3–5-drinks-per-month group of male alcohol consumers and 0.1–1.0-drinks-per-month group of female alcohol consumers were used as the reference groups to compare with other alcohol consumption groups. The risk of total mortality was 1.5 times higher among male nondrinkers as compared with reference group persons (RR = 1.5, 95% CI 1.1–2.2) (Fig. 3). They also had a higher (by 88%, RR = 1.88, 95% CI 0.9–3.8) risk of acute MI morbidity. The tendency to a higher risk of IHD mortality was also determined among nondrinkers as compared with drinkers of 3–5 drinks per month. A similar tendency to a risk of IHD mortality and total mortality, and acute MI morbidity in relation to alcohol consumption was also found among women, but the differences in risk between the groups were not significant (Fig. 4).
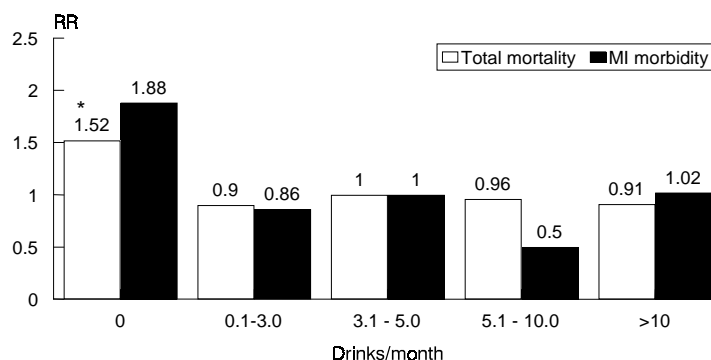

Figure 3. Prognostic impact of alcohol consumption pattern on morbidity of myocardial infarction and mortality among Kaunas men (multivariate analysis) RR, relative risk
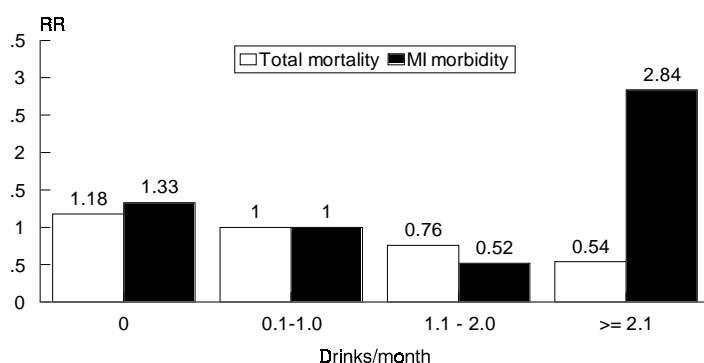
Fig. 4. Prognostic impact of alcohol consumption pattern on morbidity of myocardial infarction and mortality among Kaunas women (multivariate analysis) RR, relative risk

DISCUSSION

Using data from the CINDI study, we have compared the Kaunas population (urban) with populations of five rural regions by alcohol consumption habits. Alcohol drinking habits were self-reported and were ascertained via a special questionnaire. The validity of self-reported alcohol intake may be questioned, but no other available method such as sales reports, collateral information has proved to be more valid (12). Usually underreporting does take place, especially among heavy drinkers (13). More than 90% of screened men both in Kaunas and in rural population reported regularly consuming alcohol. The only difference in alcohol consumption habits between rural and urban male samples was the higher prevalence of never-drinkers in rural population (5.3% vs. 2.4%). Alcohol drinking was more common among Kaunas women as compared with women screened in rural regions (85.5% vs. 78.2%). Almost one-fifth of women surveyed in rural region stated that they were never-drinkers, against 1.3% among Kaunas women. The data reported by epidemiological studies, regarding the urban-rural differences in alcohol intake pattern are controversial. Some of the studies reported on a greater prevalence of regular alcohol intake among rural population, whereas other ones showed the opposite trend (3, 4, 14).

The only manifest difference between rural and urban male drinkers in our study was the higher proportion of cases of frequent alcohol drinking (once or several times a week) among men screened in rural region (12.1% vs. 6.8%). A similar pattern was also determined among women: the proportion of those consuming alcohol beverages several times a month and once a week was larger in rural area as compared with Kaunas.

Men and women in rural regions also consumed alcohol in larger amounts than those from Kaunas population. The share of drinkers consuming large amounts of alcohol (> 20 drinks a month among men and > 2 drinks a month among women) was significantly larger in rural region as compared with urban population both for men and women. Another study conducted in Lithuania in 1994 has showed that strong alcohol beverages were consumed once a week or more frequently by 6.9% of rural women and by 2.6% of urban women, while two or three times a month by 22.4% and by 15.4%, respectively (3).

We analyzed the influence of alcohol consumption on end-points (nonfatal acute MI, and mortality from IHD, as well as total mortality) in urban population. The risk of nonfatal MI was significantly higher among male nondrinkers as compared with the reference group (the 3–5-drinks-a-months drinkers). Male nondrinkers also had a higher risk of total mortality as compared with the reference ones (RR = 1.9, 95% CI 1.1–3.1). A similar tendency for risk of total mortality and nonfatal MI in relation to alcohol consumption was also documented among women. The U-shaped or J-shaped association between alcohol intake and total mortality, same as for mortality from IHD, is supported by many population studies (15–18). It has been argued that the higher mortality among abstinents as compared with moderate drinkers might result from misreporting of alcohol consumption, confounding or inclusion of high proportion of ex-drinkers or individuals with pre-existing diseases among abstainers. But a cohort study carried out among 8,043 construction workers aged 25–64 yrs showed a U-shaped association between alcohol consumption and all-cause mortality even after the exclusion of nondrinkers with pre-existing disease from the analysis (19). Similarly, the protective effect of alcohol intake on cardiovascular mortality found in a study performed in the Netherlands persisted after the exclusion of persons with cardiovascular or other major diseases at baseline from the analysis (20). Alcohol intake in the amount of one to two drinks per day results in an estimated 20–40% reduction in cardiovascular events and also is associated with the lowest all-cause mortality (21, 22). The following mechanisms seem to be in place with respect to the beneficial effect of alcohol on mortality: 1) in the absence of severe liver impairment, alcohol consumption raises levels of high-density lipoprotein

cholesterol (HDL). HDL removes fatty deposits from large vessels and thus is associated with a lower risk of IHD death (23); 2) moderate alcohol intake favourably affects coagulation profiles, in particular, through its effects on platelet aggregation and fibrinolysis (24). An additional protective effect, according to major cohort studies, has been attributed to wine, probably due to antioxidant effects (21). Despite these favorable effects, the current evidence is not enough to justify prescribing alcohol to prevent cardiovascular disease.

CONCLUSIONS

1. The proportion of never-drinkers both among men and women samples in rural region is significantly higher as compared with Kaunas samples (5.3% *vs*. 2.4% and 19.9% *vs*. 11.3%, respectively).

2. Both male and female alcohol consumers in rural region consumed alcohol beverages more frequently and in larger amounts as compared with urban population.

3. The total mortality risk is higher among non-drinking men as compared to those consuming 3–5 drinks a month (RR = 1.5).

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KAIMO IR MIESTO GYVENTOJŲ ALKOHOLIO VARTOJIMO ĮPROČIŲ SKIRTUMAI BEI JŲ ĮTAKA MIRTINGUMUI IR SERGAMUMUI MIOKARDO INFARKTU

S a n t r a u k a .

Straipsnyje pateikiami 35–64 m. amžiaus Kauno ir penkių Lietuvos kaimiškųjų rajonų centrų gyventojų tyrimo duomenys, surinkti 1983–1985, 1986–1987 ir 1992–1993 m., vykdant tarptautinę Lėtinių neinfekcinių ligų integruotos profilaktikos programą (CINDI). Darbo tikslas buvo palyginti kaimo ir miesto gyventojų alkoholio vartojimo įpročius bei įvertinti alkoholio vartojimo įtaką sergamumui ūmiu miokardo infarktu (MI) ir mirtingumui dėl įvairių priežasčių. Nustatyta, kad tarp miesto moterų buvo patikimai daugiau vartojančių alkoholį negu tarp kaimiškųjų rajonų moterų (atitinkamai 85,5 ir 78,2%). Niekada alkoholio nevartojusių asmenų dalis tiek tarp vyrų, tiek tarp moterų buvo patikimai didesnė kaimiškųjų rajonų atrankose, palyginti su Kauno atrankomis. Kaimiškųjų rajonų alkoholį vartojantys vyrai ir moterys jį vartojo ne tik dažniau, negu miesto gyventojai, bet ir didesniais kiekiais. Nevartojančių alkoholio vyrų bendrojo mirtingumo (RR = 1,5; 95% PI 1,1–2,2) rizika buvo didesnė negu vartojančių 3–5 standartinio kiekio vienetus per mėnesį.

Raktažodžiai: populiaciniai tyrimai, miesto ir kaimo, alkoholio vartojimas, sergamumas, santykinė rizika, išeminė širdies liga, miokardo infarktas