Interregional Differences in Health in Slovenia
II. Estimated Prevalence of Selected Behavioral Risk Factors for Cardiovascular and Related Diseases

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Aim. To estimate the prevalence of selected behavioral risk factors for cardiovascular and related diseases in western, central, and eastern region of Slovenia and to determine interregional differences.

Methods. A national survey on health status and health behavior of the adult population included 15,379 Slovene inhabitants, aged 25 to 64. The overall response rate to a mailed questionnaire was almost 64%, and 9,043 questionnaires were eligible for analysis. Prevalence rates per 100 population (smoking, nutrition, alcohol intake, physical activity, stress) were determined, chi-square test was used for global assessment of interregional differences, and logistic regression for adjusting them for sex and age.

Results. Interregional differences in prevalence were observed in very unhealthy nutrition related to obesity and diabetes (west: 34.0, center: 30.6, east: 41.8; p<0.001), very unhealthy nutrition related to hypertension (west: 25.5, center: 29.4, east: 28.4; p=0.011), very unhealthy nutrition related to atherosclerosis-based diseases (angina pectoris, myocardial and brain infarction, etc.) (west: 33.1, center: 31.8, east: 44.1; p<0.001), heavy alcohol drinking (west: 11.2, center: 12.0, east: 15.2; p<0.001), and physical inactivity (west: 18.0, center: 21.0, east: 15.3; p<0.001), but not in smoking (west: 22.4, center: 24.5, east: 23.9; p=0.230) or stress (west: 23.2, center: 24.4, east: 24.7; p=0.388).

Conclusion. We confirmed significant interregional differences in the prevalence of most observed behavioral risk factors. In behaviors with statistically significant interregional differences, the highest prevalence was confirmed for eastern Slovenia.

Key words: alcohol drinking; lifestyle; motor activity; nutrition; prevalence; Slovenia; smoking; stress

Slovenia is a Central European country, which borders Austria in the north, Hungary in the east, Italy in the west, and Croatia in the southeast. It exhibits remarkable diversity between its regions in many aspects, natural, geographical, historical, economical, demographic, and social, as well as in health.

Interregional differences in death rates in Slovenia are considerable (1,2). There are also differences in the incidence of malignant neoplasms (3). In the first part of our study published in this issue (4), we also showed differences in the prevalence of selected cardiovascular and related disease states. The observed differences could be attributed mainly to differences in incidence of diseases on the one hand and to mortality on the other. The incidence of noncommunicable diseases is mainly related to health behavior of the population (lifestyle), while mortality is related also to differences in accessibility to health services. We were focused on various possible causes of the differences related to their incidence, especially those in health behavior, in which the interregional differences in Slovenia were not assessed yet.

One of the main hypotheses in the research program on health status and health behavior in the adult Slovene population was that substantial interregional differences in the prevalence of selected aspects of health behavior exist in Slovenia, with the best situation being in western and the worst in eastern Slovenia.

Participants and Methods

Participants

The data were collected in late spring 2001 in the cross-sectional survey entitled “Risk Factors for Non-communicable Diseases in Adults in Slovenia” (5). Conceptually this survey is part of a wider international project in the frame of the Countrywide Integrated Non-communicable Diseases Intervention (CINDI) program (6,7), supported by the World Health Organization (WHO), CINDI Health Monitor (CHM) (8,9). The basic research protocol for the survey entitled “Risk Factors for Non-communicable Diseases in Adults in Slovenia” (5) was approved by the Ethical Committee of the Republic of Slovenia in April 2001.
The stratified random sample was drawn from the Central Population Registry of the Republic of Slovenia (CRPRS) and the sampling was performed by Statistical Office of Republic of Slovenia (SORS). The sample size was 15,379, and the age range was 25–64 years.

Self-administered postal questionnaire, based on the CHM Core Questionnaire, inquiring about health status and health behaviors (smoking, nutrition habits, alcohol intake, physical activity, and traffic safety) (8,10), and adapted for local needs was used (11). The overall response rate was 64% (15,153 inhabitants contacted; 226 not included because of changed domicile, severe illness, or death; 9,666 questionnaires returned). The response rate was increased by two reminders to non-respondents (the first reminder contained a new questionnaire form and the second only a new invitation letter) and by a lottery with winning prizes promoting healthy behavior (visits to health resorts, bicycles etc.).

Also an extensive media campaign was mounted at national and regional levels. The response rates to the sent questionnaires and reminders were 47%, 56%, and 64%, respectively.

**Observed Regions**

The nine health regions in Slovenia, with populations varying from slightly less than 75,000 (Ravne) to more than 600,000 (Ljubljana), were merged for the purpose of this study into 3 large regions according to common geographical position and socio-economic characteristics. The Western Region included Nova Gorica, Koper, and Kranj; Central Region included Ljubljana; and Eastern Region included Novo mesto, Celje, Maribor, and Murska Sobota. The sample sizes of respondents were 2,019 in the Western, 2,638 in the Central, and 4,377 in the Eastern Region. The unequal size of regional samples was due to merging similar basic regions with unequal populations, but the distribution corresponded to the distribution in the total population of adults in Slovenia by regions (goodness-of-fit chi-square: 3.27; p=0.195).

**Selected Behavioral Risk Factors**

Behavior was observed in relation to smoking, nutrition, alcohol consumption, physical activity, and stress. For analyzing data on health behavior, except in smoking, complex indicators were derived.

The smoking status of participants was assessed on the basis of the question: "Do you smoke?" (possible answers: I don't smoke and I never have; I don't smoke now but I smoked in the past; yes, I smoke). The prevalence of smoking at the present time was recorded.

Unhealthy behavior related to nutrition was defined on the basis of several strategies and recommendations (12-17), taking into account circumstances specific to Slovenia (cultural and economic), and possibilities from the CINDI Health Monitor Survey (CHMS) Questionnaire. Three different types of unhealthy nutrition behavior were defined: 1) related to obesity and diabetes, 2) related to hypertension, and 3) related to atherosclerosis-based diseases (angina pectoris or myocardial and brain infarction). Complex indicators were derived from several basic components (Table 1). In unhealthy nutrition related to obesity and diabetes and that related to hypertension, all most important recommended components, available in our database, were taken into consideration. In unhealthy nutrition related to atherosclerosis-based diseases, the reduction of components included was necessary. Those less important for the present study were omitted (daily frequency of meals, kind of bread mostly consumed, and frequency of consumption of cereals). All components were considered as equally important and the number of unhealthy components was calculated for every participant. The participants were classified into three groups on the basis of the median value of the number of unhealthy components for the whole sample as follows: a) obesity and diabetes related nutrition: healthy (0 components), moderately unhealthy (1-2 components), and very unhealthy (3-7 components); b) hypertension related nutrition: healthy (0 components), moderately unhealthy (1 component), and very unhealthy (2-4 components); and c) atherosclerosis-based diseases related nutrition: healthy (0 components), moderately unhealthy (1-3 components), and very unhealthy (4-9 components).

Table 1. Criteria (nutritional components) used for classifying nutritional behavior according to international recommendations and strategies (12-17) and possibilities of Slovenia 2001 CINDI® Health Monitor Survey Questionnaire

<table>
<thead>
<tr>
<th>Nutritional component</th>
<th>Behavior classified as unhealthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition related to obesity and diabetes (12-15)</td>
<td>any fat as spread on bread</td>
</tr>
<tr>
<td>fat mostly used for spreading on bread</td>
<td>whole milk; ordinary cow’s milk or ordinary shop milk with about 3.2 % fat once per day or more frequently</td>
</tr>
<tr>
<td>kind of milk mostly consumed</td>
<td>once per week or more frequently</td>
</tr>
<tr>
<td>consumption of red meat</td>
<td>4 times per week or more frequently</td>
</tr>
<tr>
<td>consumption of fried food</td>
<td>every day</td>
</tr>
<tr>
<td>consumption of tinned food</td>
<td>less than three meals</td>
</tr>
<tr>
<td>consumption of sweet pastries</td>
<td>less frequently than once per day</td>
</tr>
<tr>
<td>consumption of sweet soft drinks</td>
<td>less frequently than once per day</td>
</tr>
<tr>
<td>Nutrition related to hypertension (14-17)</td>
<td>salting almost always before tasting</td>
</tr>
<tr>
<td>daily frequency of meals</td>
<td>margarine, butter, or lard</td>
</tr>
<tr>
<td>consumption of vegetables</td>
<td>whole milk or ordinary cow’s milk; ordinary shop milk with about 3.2 % fat less frequently than once per day</td>
</tr>
<tr>
<td>consumption of fruit</td>
<td>less frequently than once per day</td>
</tr>
<tr>
<td>consumption of sweet pastries</td>
<td>once per day or more frequently</td>
</tr>
<tr>
<td>salting of meals at the table</td>
<td>less than once per week</td>
</tr>
<tr>
<td>Nutrition related to atherosclerosis-based diseases (14-17)</td>
<td>consumption of vegetables</td>
</tr>
<tr>
<td>fat mostly used for food preparation at home</td>
<td>consumption of vegetables</td>
</tr>
<tr>
<td>type of milk mostly consumed</td>
<td>consumption of red meat</td>
</tr>
<tr>
<td>consumption of vegetables</td>
<td>consumption of fish</td>
</tr>
<tr>
<td>consumption of fruits</td>
<td>consumption of eggs (as an independent dish)</td>
</tr>
<tr>
<td>consumption of cereals</td>
<td>consumption of fried food</td>
</tr>
<tr>
<td>consumption of sweet pastries</td>
<td>consumption of sweet pastries</td>
</tr>
</tbody>
</table>

*CINDI – Countrywide Integrated Non-communicable Diseases Intervention (11).*
To derive estimates of the average level of physical activity, the original questions from the CHM Questionnaire were replaced by questions from the International Physical Activity Questionnaire (IPAQ, ref. 20) as recommended by CINDI WHO (8,10). A short last-7-days self-administered format of IPAQ (20) was used. Vigorous and moderate physical activity and walking were assessed. For each type of physical activity two questions were posed: “During the last 7 days, on how many days did you carry out a vigorous or moderate physical activity or take a walk?”, and “On those days, how much time did you spend, on average, doing a vigorous or moderate physical activity or walking (in hours and minutes)?” The rough level of physical activity of participants was estimated by classifying them into two groups according to whether or not they performed a physical activity of any type at least 4 times a week. According to this criterion the participants were classified as inactive, irregularly active, or regularly active participants. Zero and irregular physical activity of any type were considered as insufficient physical activity and any other physical activity was considered as sufficient. The prevalence of insufficient physical activity was recorded.

The perception of stress and related feelings was assessed on the basis of two questions: “How often do you feel tense, stressed, or under a lot of pressure?” (possible answers: never; rarely; sometimes; frequently; every day), and “Do you feel that you are able to cope with these feelings?” (possible answers: I can cope with them easily; I can cope with them with moderate efforts; I can cope with them with major efforts; I can barely cope with them, I cannot cope with them at all, my life is almost unbearable). The participants were classified into two groups. Those who answered that they felt tense, stressed, or under a lot of pressure frequently or every day, were classified into the first group, excluding all those who answered that they could cope with these feelings easily. All other participants (including those excluded from the first group) were classified into the second group. The prevalence of the first group was observed.

Statistical Analysis

The estimates of prevalence for the selected risk behavior were defined first for each region as a whole and then divided according to sex and age.

Overall interregional differences were analyzed using the chi-square test (21,22) while differences adjusted for the effects of sex and age were assessed using binary multiple logistic regression (23,24). In multivariate analysis age was included as a continuous variable, while for sex and regions dummy variables were created. In all comparisons, the group with the lowest prevalence was used as a baseline. P-value of 0.05 or less was considered significant.

SPSS statistical package for Windows (Version 11.0, SPSS Inc., Chicago, IL, USA) was used for the analysis of data.

Results

Respondents did not differ statistically from non-respondents in age or place of permanent residence. There were slightly less men (47.0%) than women (53.0%) among respondents at a ratio 1:1 (according to CRPRS in 2001 the ratio was 1:1). Similar situation was observed in other countries which have already performed similar surveys (9,25-28). Like in Finland, Lithuania, or Latvia, the overall representativeness of the sample was assessed as good.

The questionnaires of 9,034 respondents were eligible for analysis. Data on region, sex, and age were available in all of them, and they were matched with basic sample data, provided by SORS. Among these participants, there were 4,121 men (45.6%) and 4,913 women (54.4%).

No statistically significant differences between regions regarding sex and age distribution were observed (sex: p=0.145, age: p=0.118).

The presence or absence of the selected risk behavior was possible to establish for all participants in whom all the elements composing the derived complex indicators were present: smoking: 8,904 (98.6%); very unhealthy nutrition related to obesity and diabetes: 8,142 (90.1%); very unhealthy nutrition related to hypertension: 8,565 (94.8%); very unhealthy nutrition related to atherosclerosis-based diseases: 7,990 (88.4%); heavy drinking: 8,319 (92.1%); insufficient physical activity: 8,718 (96.5%); and stress: 8,987 (99.5%).

Behavioral Risk Factors

Smoking. The global prevalence for Slovenia was 23.7%. It was highest in central and lowest in western Slovenia (Table 2), at a ratio of 1:1.1 (p=0.230). After adjustment for sex and age, the prevalence was lowest in western and highest in central Slovenia (Table 3). The difference between central and western Slovenia was not statistically significant (p=0.064) as the difference between eastern and western Slovenia (p=0.275).

Very unhealthy nutrition related to obesity and diabetes. The global prevalence for Slovenia was 36.7%. It was highest in eastern and lowest in central Slovenia (Table 2), at a ratio of 1:1.4 (p<0.001). After adjustment for sex and age the prevalence was lowest in central and highest in eastern Slovenia (Table 3). The differences between western and central Slovenia (p=0.022) and between eastern and central Slovenia (p<0.001) were statistically significant.

Very unhealthy nutrition related to hypertension. The global prevalence for Slovenia was 28.1%. It was highest in central and lowest in western Slovenia (Table 2), at a ratio of 1:1.2 (p=0.011). After adjustment for sex and age the prevalence was lowest in western and highest in central Slovenia (Table 3). The differences between central and western Slovenia were statistically significant.

Table 2. Estimates of prevalence (per 100 population) of selected behavioral risk factors for cardiovascular and related diseases in three regions of Slovenia

<table>
<thead>
<tr>
<th>Behavioral risk factor</th>
<th>western</th>
<th>central</th>
<th>east</th>
<th>chi-square</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>22.4</td>
<td>24.5</td>
<td>23.9</td>
<td>2.940</td>
<td>2</td>
<td>0.230</td>
</tr>
<tr>
<td>Very unhealthy nutrition related to obesity and diabetes</td>
<td>34.0</td>
<td>30.6</td>
<td>41.8</td>
<td>87.308</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very unhealthy nutrition related to hypertension</td>
<td>29.4</td>
<td>21.9</td>
<td>28.4</td>
<td>90.049</td>
<td>2</td>
<td>0.011</td>
</tr>
<tr>
<td>Very unhealthy nutrition related to atherosclerosis-based diseases</td>
<td>33.1</td>
<td>31.8</td>
<td>44.1</td>
<td>158.801</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Heavy alcohol drinking</td>
<td>11.2</td>
<td>12.0</td>
<td>15.2</td>
<td>22.201</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Insufficient physical activity</td>
<td>18.0</td>
<td>21.0</td>
<td>15.3</td>
<td>34.748</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Stress</td>
<td>23.2</td>
<td>24.4</td>
<td>24.7</td>
<td>1.993</td>
<td>2</td>
<td>0.388</td>
</tr>
</tbody>
</table>


**Abbreviations: df – degrees of freedom.
between eastern and western Slovenia (p = 0.028) were statistically significant. Very unhealthy nutrition related to atherosclerosis-based diseases. The global prevalence for Slovenia was 38.0%. It was highest in eastern and lowest in central Slovenia (Table 2), at a ratio of 1:1.4 (p < 0.001). After adjustment for sex and age, the prevalence was lowest in eastern and highest in central Slovenia (Table 3). The differences between western and eastern Slovenia (p = 0.010) and between central and eastern Slovenia (p < 0.001) were statistically significant.

Stress. The global prevalence for Slovenia was 24.3%. It was highest in eastern and lowest in western Slovenia (Table 2), at a ratio of 1:1.1 (p = 0.388). After adjustment for sex and age, the prevalence was lowest in western and highest in eastern Slovenia (Table 3). The differences between central and western Slovenia (p = 0.319) and between eastern and western Slovenia (p = 0.151) were not statistically significant.

Discussion

We confirmed the existence of significant inter-regional differences in the prevalence of unhealthy nutrition, heavy alcohol drinking, and insufficient physical activity.

With regard to the risky nutritional behaviors for cardiovascular and related disease states, in general the worst situation was observed in eastern Slovenia. In this part of the country, the prevalence of very unhealthy nutrition related to obesity and diabetes and very unhealthy nutrition related to atherosclerosis-based diseases were the highest. Only for the very unhealthy nutrition behavior related to hypertension,
the prevalence was highest in central Slovenia. These results indicate that in order to diminish interregional differences, it is essential to intervene in eastern Slovenia. The caveat of present research is that by this type of study design only reporting of nutrition habits is observed.

The differences are considerable in heavy drinking. Assessed roughly, the situation was the worst in eastern Slovenia and best in western Slovenia, despite the fact that both are wine provinces. In this context the cultural differences between Slovene regions should be analyzed.

The problems with the interpretation of interregional differences in physical activity are the obvious consequence of the questionnaire used. A short last 7-days self-administered format of IPAQ observes several kinds of vigorous and moderate physical activity at the same time (leisure time activities, housekeeping work, and physical activity at the working place) (20). With regard to observing the impact of regular and sufficiently intensive physical activity on human health, this inevitably means mixed-information data, which are less applicable for such types of observations. Despite important amounts of energy spent, not all kinds of physical activity are equally healthy – often they could even be unhealthy. Vigorous physical activity in unnatural positions for longer periods of time, as is the case for heavy industry physical workers, could be extremely unhealthy, whereas periodical vigorous physical activity during the leisure time could constitute both physical and psychical relaxation and obviously be healthy. Another problem related to mixed-information data is the fact that they encompass to a certain extent the socio-economic condition of participants. This problem is certainly very important when assessing interregional differences in Slovenia. With regard to the daily use of energy, it is understandable that the situation with regular intensive physical activity is best in eastern Slovenia because the economy is largely rural (29, 30). Prior to any more definite conclusions on this problem, more in-depth analysis of the available data is necessary, adjusting insufficient physical activity prevalence also for education level and occupation. For future research the part on physical activity in the CHM questionnaire at the international level has to be reassessed as a lot of countries have already experienced similar problems with the same set of questions (9).

We could not find any important interregional differences in the prevalence of smoking and stress. The most reasonable and logical explanation for smoking is that, in Slovenia, many good interventions which promote the quitting of smoking have been carried out at national and regional levels. For more than a decade, CINDI-Slovenia and many other governmental and non-governmental organizations have been very active in their systematic antismoking activities on national and regional levels. All antismoking activities are very well supported by the very restrictive “Act on Smoking” which was put into action in 1996. Prior to any more definite conclusions that there are no interregional differences in stress in Slovenia, more in-depth analysis is necessary, adjusting stress prevalence also for education level, employment, and cultural patterns (dividing Slovenia to only three regions makes it too crude to assess the interregional differences in stress; another way of dividing Slovenia should be performed, taking into account the social subcultures). Also the answers to such questions could be subject to the current mood of the participant and may not reflect the real situation.

The observed interregional differences in behavioral risk factors mostly follow the same pattern as the differences in cardiovascular and related diseases (4).

In the process of studying the area of lifestyle we could not avoid the connections between health behavior and cultural patterns in different population groups. Slovenia is heavily conditioned by its transitional geographical position in Europe as all its geographical units extend beyond the borders into neighboring countries. Such a situation provides a source for explaining the interregional differences together with the many similarities between Slovenia and its neighboring countries like traditional architecture, urban planning, and agricultural techniques. Close relations between people on both sides of the borders are reflected everywhere through the culture of living, and that is why there are so many different cultural patterns of living present in Slovenia – the most outstanding being Mediterranean (West), Alpine (North), and Pannonian (East). The healthiest traditional lifestyle from the nutritional point of view is seen to be in the western, and the unhealthiest in eastern Slovenia. Based on the results of the present study on health behavior, it is clear that the consumption of sea food and olive oil is highest in western Slovenia, while consumption of lard is highest in the most easterly part (31, 32). The phenomenon of interregional differences in health behavior is not unique to our country and has been reported from other countries as well. For example Denny et al (33) reported regional differences in cigarette smoking, no leisure time physical activity and binge drinking among American Indians and Alaska Natives in USA, Bjerregaard et al (34) differences in consumption of marine food and smoking in Greenland and in comparison to Denmark, Legleye (35) the differences in alcohol consumption in different regions of France, and Shopland et al (36) regional differences in cigarette smoking in the USA.

Changing the traditional lifestyle is one of the most important elements in reducing the interregional differences in health but extremely difficult, and a process of very long duration, tightly bound to the economy and politics of a country (37). In unfavorable socio-economic circumstances, the preservation of traditional lifestyle is endorsed and can be reduced only by strong multisectoral engagement (38). Such conditions currently exist in eastern Slovenia (29, 39, 40).

To diminish the interregional disparities in health behavior, Slovenia has already adopted some important provisions based on the pattern of a similar process in Finland, which proved to be successful and effective (41). Numerous multisectoral activities, including primary health prevention activities, were fo-
cused on changing the nutritional and physical activity behavior of the population, and have been in process since 2001 at the national level, and in the most north-eastern region (42,43). In health prevention activities, specific socio-economic and cultural circumstances were taken into consideration as much as possible, but specific population subgroups at risk for certain unhealthy behavior for more targeted activities still need to be identified.

In this paper only the problems closely related to assessment of interregional differences are discussed. Also the observed risk behavior was adjusted for sex and age only. Another possible limitation of the present study could be that information on nutritional habits is subjected to certain bias (answers according to population norms and standards). Better information could be obtained only with a much more complex and expensive study focused on the detailed analysis of these habits (with actual measurement of food intake) in different parts of Slovenia. Physical activity was difficult to assess and should be interpreted carefully. An assessment taking into account the level of education, employment status and other factors underlying the socio-economic situation of participants from a particular region should also be performed. On the other hand, the strength of the study is that information on the prevalence of behavioral risk factors, even rough, is very important for health promotion and disease prevention planning at national or regional levels, since these data provide first comprehensive information about the dimension of the problem in the community, which could also be useful for countries neighboring Slovenia.

In conclusion, our study revealed the significant interregional differences in the prevalence of selected behavioral risk factors for cardiovascular and related diseases in Slovenia, in particular unhealthy nutrition, heavy alcohol drinking, and insufficient physical activity. In behaviors with statistically significant interregional differences, the highest prevalence was largely confirmed for eastern Slovenia. Only for the category of insufficient physical activity was the situation apparently best in eastern Slovenia. Taking into account the specificity of data on physical activity (the non-differentiation between leisure and working time physical activities) this result should be interpreted with caution. On the basis of data available from the research on health status and health behavior we can, in the next step, assess each unhealthy behavior in depth, taking into account also the socio-economic risk factors. This would also be the way to identify the population groups at risk of unhealthy behavior for taking focused public health actions.

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