Risk factors for noncommunicable diseases in Lithuanian rural population: CINDI survey 2007

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Key words: *risk factors; noncommunicable diseases; prevalence; CINDI program.*

Summary. *The aim of the study was to assess the risk profile for noncommunicable diseases in Lithuanian rural population.*

Material and methods. Within CINDI program, the risk factor survey was carried out in five rural regions of Lithuania in random sample of population aged 25–64 years in 2007. The risk factors were defined according to the WHO criteria. A total of 1739 participants were enrolled in the study.

Results. The prevalence of hypertension was considerably higher among men than among women (60.3% and 44.6%, respectively). Hypercholesterolemia was identified in half of examined persons with no gender difference. The proportion of obese female persons was greater than male. Metabolic syndrome was diagnosed in 15.1% of men and in 21.5% of women. The significant gender difference was observed in the prevalence of regular smoking (47.5% in men and 18.1% in women) as well as risky alcohol consumption (26.7% of men and 3.1% of women). The majority of rural population was lacking leisure-time physical activity. The prevalence of hypertension, hypercholesterolemia, obesity, and metabolic syndrome was increasing with age in both men and women. Regular smoking and risky alcohol consumption were more common among younger than older population. Leisure-time physical activity tended to increase with age.

Conclusions. The prevalence of risk factors for noncommunicable diseases in Lithuanian rural population is high. The obtained data prove that comprehensive and intersectorial preventive actions aimed at the reduction in the risk of noncommunicable diseases are urgently needed in Lithuania.

Introduction

Noncommunicable diseases (NCDs) such as cardiovascular, cancer, chronic respiratory disease, and diabetes are leading causes of death and disability in Europe (1). These diseases are responsible for 86% of all deaths and 77% of the disease burden in the European region of the World Health Organization (WHO) (2). They substantially contribute to the inequities in health between population groups within a country and between the countries. Epidemiological studies have clearly demonstrated that several risk factors (RFs), such as hypertension, dyslipidemias, obesity, smoking, unhealthy nutrition, low physical activity, and excessive alcohol consumption are common for the major NCDs. Based on this evidence, the concept of integrated approach for the prevention and control of NCDs was developed (3). In 1982–1983, under the initiative of the WHO Regional Office for Europe, the Countrywide Integrated Noncommunicable Diseases Intervention (CINDI) Program has been developed addressing NCDs through integrated action on common RFs (4). The program promotes integrated disease prevention and health promotion through primary health care system, as well as active participation of both, the community and the individuals. For effective monitoring and evaluation of the health interventions, CINDI developed innovative NCD information system. To monitor trends in RFs, the regular cross-sectional surveys constitute an obligatory component of this system. The surveys are carried out either in demonstration areas or at national level of CINDI participating countries. Lithuanian CINDI program covers six demonstration areas: Kaunas city represents urban and five semirural geographical/administrative regions – rural population of the country. Since 1983, five cross-sectional RF sur-

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veys have been carried out in Lithuania. This paper presents the results of the last survey conducted in rural demonstration areas in 2007.

Material and methods

The inhabitants aged 25–64 years in five administrative regions (Kaišiadorys, Kretinga, Kupiškis, Joniškis, and Varėna) constituted rural study population of CINDI-Lithuania totaling to 165 000 people. The independent random samples stratified by gender and 10-year age groups are drawn from the lists of the inhabitants registered at the primary health care centers for regular RF survey at 5-year intervals. For the 2007 survey, 200 subjects (100 males and 100 females) in four age groups (25–34, 35–44, 45–54, 55–64 years) were selected in each region for health examination. Some selected subjects (n=113) were not able to participate in the survey due to long absence in the country. Participants in whom information on risk factors was missing were excluded from the analysis. A total of 1739 participants were enrolled in this study. The distribution of examined persons by age and gender is presented in Table 1.

The survey methods strictly followed the WHO CINDI protocol (4). The health examination included interviews, clinical examinations, and laboratory tests. The survey instrument contained questions on sociodemographic data, medical history, and health behaviors (smoking, alcohol consumption, dietary and physical activity habits). Clinical examination included measurements of blood pressure (BP), height and weight, and electrocardiography. BP was measured with a standard mercury sphygmomanometer on the right arm of the participant, who was seated for 5 minutes before the measurement. Systolic BP was recorded at the first phase of Korotkoff sounds to the nearest 2 mm Hg and diastolic BP – at the fifth phase. Two BP measurements were taken, and the average was calculated and used in the analysis. Participants were classified as hypertensive if their systolic BP was ≥140 mm Hg and/or diastolic BP ≥90 mm Hg, or they received antihypertensive drug treatment for the last 2 weeks.

Height was measured without shoes, to the nearest centimeter, using a statometer. Weight was measured without shoes, in light indoor clothing, to the nearest 0.1 kg, using medical scales. Body mass index (BMI) was calculated as weight divided by height squared (kg/m^2). Overweight was defined as BMI ≥25 kg/m^2 and obesity as BMI ≥30 kg/m^2. Waist circumference was measured by standard meter, to the nearest 0.5 cm. Visceral obesity was diagnosed if waist circumference for men was ≥102 cm, for women ≥88 cm.

The cubital venous blood for biochemical lipid investigation was taken using vacutainers. The subjects were asked to abstain from food intake at least 12 hours. Total serum cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and triglyceride (Tg) were determined using autoanalyzer Bayer ADVIA 1650. The lipid analysis was made in the laboratory of Hospital of Kaunas University of Medicine. Hypercholesterolemia was defined when total serum cholesterol was ≥5.0 mmol/L.

Glucose level in capillary blood was determined using Accutrend GC system. Hyperglycemia was defined as glucose level ≥6.1 mmol/L.

Metabolic syndrome was defined by NCEP-ATP III recommendations if three or more of the following symptoms were present: BP ≥130/85 mmHg; serum Tg ≥1.7 mmol/L; HDL cholesterol <1.0 mmol/L for men and <1.3 mmol/L for women; glucose ≥6.1 mmol/L; waist circumference ≥102 cm in men, ≥88 cm in women (5).

Information on smoking, alcohol consumption, and physical activity was gathered using a standard questionnaire. A person who smoked at least one cigarette per day was considered regular smoker. The standard questionnaire on alcohol consumption contained questions about type and frequency of alcohol consumption and amount of alcohol consumed at one occasion. The amount of alcohol consumed on one occasion was recalculated into standard alcohol units

Table 1. **Distribution of participants by age and sex**

Age groups, years	Men		Women		Total	
	n	%	n	%	n	%
25–34	104	14.0	172	17.2	276	15.9
35–44	193	26.0	252	25.2	445	25.6
45–54	202	27.3	265	26.6	467	26.8
55–64	242	32.7	309	31.0	551	31.7
Total	741	100	998	100	1739	100

(SAUs) using the following formula:

SAU = amount (in liters) × strength of alcoholic drink (beer – 5%, wine – 12%, strong alcohol – 40%). A SAU equals 10 g of ethanol.

Then the amount of SAUs consumed during a month was calculated. Risky alcohol consumption was determined when a man consumed ≥56 SAUs and a woman consumed ≥28 SAUs per month (6).

The participants were considered having low physical activity if they had leisure physical exercise for at least 30 minutes causing them at least mildly short of breath or to perspire at least four times a week.

Statistical analysis was performed using the statistical software package SPSS 15.0 for Windows. The age structure of Lithuanian population aged 25–64 years was used as a standard for standardization of the prevalence of RFs in study population. Continuous variables were compared using ANOVA with post hoc Bonferroni pairwise comparisons or the Student's *t* test. Categorical variables were compared using the χ^2 test. A two-tailed P value of <0.05 was considered statistically significant.

Results

Table 2 presents the mean values of risk factors for men and women in four age groups. Age-standardized mean systolic and diastolic BP was higher in men as compared with women (140.0/90.6 mm Hg and 133.6/84.7 mm Hg, respectively). Mean systolic BP increased with age both among men and women. The difference in systolic BP between youngest and oldest age group was 21.9 mm Hg in men and 30.6 mm Hg in women. The most significant increase in mean diastolic BP among men was found between the age of 20–34 and 35–44 years. There were no statistically significant differences in diastolic BP among older age groups. Mean diastolic BP among women increased up to the age of 45–54 years, however, with no changes afterwards. Age-standardized mean BMI was 26.9 kg/m^2 in men and 27.5 kg/m^2 in women. Women aged 45–64 years had higher BMI as compared to men. Among men, the lowest mean BMI was found in the age group of 25–34 years. There were no differences in BMI among men of older age groups. Mean BMI increased with age among women. Men had larger waist circumference as compared to women (90.8 cm and 84.8 cm, respectively). The increase in mean waist circumference in men was observed up to the age of 35–44 years, in women – up to the age of 45–54 years. Mean total serum cholesterol level did not differ between men and women. The most significant increase in mean total serum cholesterol level among men was found between the age of 20–34 and 35–44 years. There were no statistically significant differences in total serum cholesterol level among men of older age groups. In women, mean total serum cholesterol level systematically increased with age. Age-standardized mean LDL cholesterol level was higher in men than women (3.1 mmol/L and 2.9 mmol/L, respectively). The association of LDL cholesterol level with age followed the same pattern as that of total serum cholesterol level. Mean HDL cholesterol level in women of all age groups was higher than in men. Mean Tg level in women increased with age while in men it was the lowest in the youngest age group with no differences among older age groups. The fasting glucose level in men of all age groups, except 55–64 years, was higher than in women. Mean glucose level in men and women younger than 45 years was lower as compared to older age groups.

The prevalence of hypertension was considerably higher among men than among women (60.3% and 44.6%, respectively) (Fig. 1). Hypercholesterolemia was identified in half of examined persons with no gender difference. The proportion of obese persons was higher in women than in men. Metabolic syndrome was diagnosed in 15.1% of men and in 21.5% of women. A significant gender difference was observed in the prevalence of regular smoking (47.5% of men and 18.1% of women) as well as risky alcohol consumption (26.7% of men and 3.1% of women) (Fig. 2). The majority of examined persons were lacking leisure-time physical activity.

The prevalence of hypertension, hypercholesterolemia, obesity, and metabolic syndrome was increasing with age in both men and women (Table 3). In the oldest age group, 8 from 10 persons had hypertension, 60.7% of men and 72.4% of women had elevated serum cholesterol level, every third men and every second women were obese, metabolic syndrome was found in 22.3% of men and 37.5% of women. Regular smoking and risky alcohol consumption were more common among younger than older population. Leisure-time physical activity tended to increase with age.

Discussion

CINDI program, which presently joins preventive efforts of 32 European countries and Canada, is an action-oriented program both at national and international levels. Based on the experiences accumulated in CINDI operations, the CINDI vision for a public health action against NCDs was developed and proposed in 2004 as a strategy to Europe for an integrated prevention of major NCDs (7). Two years later, the Regional Committee of the WHO Regional Office for Europe has unanimously approved the European

***Table 2.* Mean values and standard deviations (SD) of analyzed indicators in men and women by age**

Indicator	MEN, age groups, years				
	25–34	35–44	45–54	55–64	25–64#
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Systolic BP, mm Hg	131.8 (15.0)†	138.0 (18.8)†	143.9 (21.5)†	153.7 (23.2)	140.0 (21.0)*
Diastolic BP, mm Hg	85.4 (12.1)†	92.2 (13.0)	93.5 (12.5)	94.6 (12.7)	90.6 (13.2)*
BMI, kg/m²	25.4 (3.8) †	27.4 (5.2)	27.7 (5.2)	28.0 (5.5)	26.9 (5.0)
Waist circumference, cm	85.9 (10.6)†	92.0 (13.5)	93.6 (12.5)	94.8 (12.8)	90.8 (12.8)*
Total cholesterol, mmol/L	4.8 (1.0)†	5.3 (1.1)	5.3 (1.1)	5.1 (1.1)	5.4 (1.1)
LDL cholesterol, mmol/L	2.8 (0.9)†	3.2 (1.0)	3.2 (1.0)	3.3 (1.1)	3.1 (1.0)*
HDL cholesterol, mmol/L	1.3 (0.4)	1.3 (0.5)	1.3 (0.4)	1.3 (0.4)	1.3 (0.4)*
Triglyceride, mmol/L	1.4 (0.6)†	1.7 (0.8)	1.7 (1.0)	1.7 (0.9)	1.6 (0.8)
Glucose, mmol/L	4.9 (0.8)	4.9 (0.8)	5.2 (1.1)	5.2 (1.2)	5.0 (0.9)*
	WOMEN, age groups, years				
	25–34	35–44	45–54	55–64	25–64#
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Systolic BP, mm Hg	118.6 (12.2)†	127.7 (16.5)†	141.1 (22.7)†	151.2 (24.7)	133.6 (23.2)
Diastolic BP, mm Hg	77.6 (10.4)†	83.0 (9.9)†	89.4 (12.2)	90.5 (11.7)	84.7 (12.3)
BMI, kg/m²	24.5 (5.2)†	26.9 (6.0)†	28.9 (5.6)†	30.4 (7.3)	27.5 (6.4)
Waist circumference, cm	77.9 (12.2)†	82.5 (13.6)†	90.5 (55.5)	89.8 (3.7)	84.8 (30.3)
Total cholesterol, mmol/L	4.7 (1.0)†	4.9 (0.9)†	5.4 (1.0)†	5.7 (1.1)	5.1 (1.1)
LDL cholesterol, mmol/L	2.6 (0.8)†	2.8 (0.8)†	3.1 (0.9)†	3.4 (1.0)	2.9 (1.0)
HDL cholesterol, mmol/L	1.5 (0.4)	1.5 (0.4)	1.4 (0.4)	1.4 (0.4)	1.5 (0.4)
Triglyceride, mmol/L	1.4 (0.6)†	1.4 (0.5)†	1.6 (0.7)	1.7 (0.7)	1.5 (0.6)
Glucose, mmol/L	4.5 (0.6)	4.6 (0.8)	4.8 (1.0)	5.1 (1.4)	4.7 (1.0)

BP – blood pressure; BMI – body mass index; LDL – low-density lipoprotein; HDL – high-density lipoprotein.
#age-standardized mean and standard deviation; *P<0.05 compared with women;
†P<0.05 compared to the age group of 55–64 years.

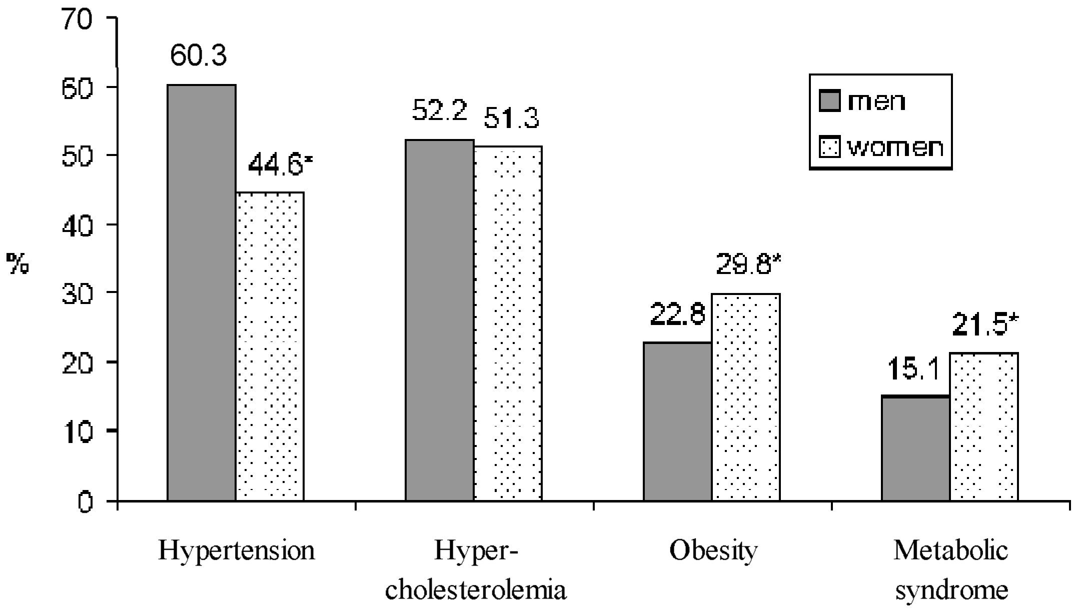

***Fig. 1* Age-standardized prevalence of hypertension, hypercholesterolemia, obesity, and metabolic syndrome among men and women aged 25–64 years**
*P<0.05 compared with men.

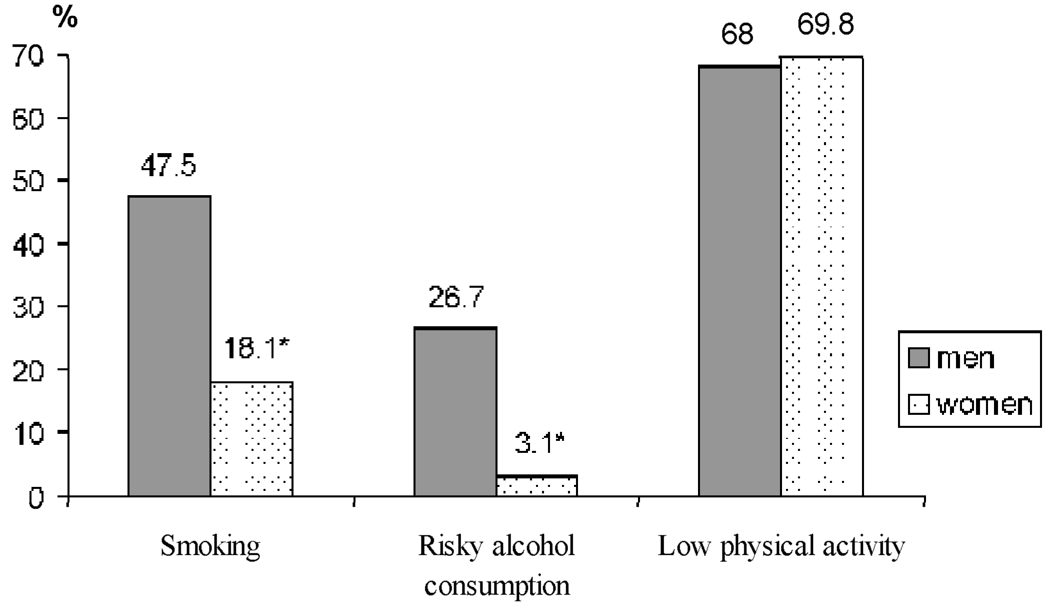

Fig. 2. **Age-standardized prevalence of behavioral risk factors among men and women aged 25–64 years**

*P<0.05 compared with men.

Table 3. **The prevalence of major risk factors for noncommunicable diseases among men and women by age**

Risk factor	Age group, years							
	25–34		35–44		45–54		55–64	
	men	women	men	women	men	women	men	women
Hypertension	39.4*	12.7†	63.0*	30.9†	71.0*	64.0†	82.1	78.6
Hypercholesterolemia	40.0*	32.0†	56.3	41.5†	58.9	64†	60.7	72.4
Obesity	12.7*	15.5†	27.0*	24.4†	26.3*	35.9†	31.2	46.9
Metabolic syndrome	6.7*	8.7†	18.7*	15.9†	17.8*	27.2†	22.3	37.5
Smoking	51.5*	33.3†	52.1*	17.8†	46.7*	11.7	34.6	6.0
Risky alcohol consumption	29.1*	5.3	32.3*	2.5	25.4*	2.7	16.0	1.3
Low leisure-time physical activity	71.6	71.3	67.6	71.5	66.8	67.3	63.8	68.9

*P<0.05 compared to the age group of 55–64 years in men.
†P<0.05 compared to the age group of 55–64 years in women.

strategy for NCD prevention and control, to the development of which CINDI program was one of major contributors (8). In May 2008, the World Health Assembly has endorsed the Action Plan for implementation of the global strategy for the prevention and control of NCDs (9, 10). The Action Plan, inter alia, recommends: a) mapping and analyzing the emerging epidemics; and b) reducing the level of exposure to risk factors (10). The objective 3 of the Action Plan deals specifically with the reduction in RFs. All the above means that RF surveillance system at the national level becomes a very important component of the national health information system. The data that are systematically collected on demographic, socioeconomic, life style, and biological RFs are necessary to map the situation, to assess ongoing trends vis-a-vis implemented health interventions and analyzing health system performance.

The data presented in this paper simply describe the risk profile for NCDs of Lithuanian rural population as measured by some traditional biological and behavioral RFs in the CINDI survey 2007. These data clearly indicate that the risk for major NCD development in Lithuanian rural population remains unacceptably high. Since 1999, only the prevalence of hypercholesterolemia has decreased in rural population (11–13). The prevalence of smoking among women and alcohol consumption among men has increased (12, 14). No changes have been observed in the prevalence of smoking among men, hypertension, and obesity in both genders (12, 15). Substantial proportion of examined persons had metabolic syndrome, the prevalence of which in rural population was investigated for the first time in Lithuania. Although more detailed specific analysis is obviously needed, nevertheless, the assumption might be made that high level and high prevalence of RFs should be considered as important contributor to high mortality rates caused by major NCDs in Lithuanian population. The surveys carried out in the United States and Western European countries have demonstrated the decline in the prevalence of major NCD risk factors, except overweight and obesity, over the last decades (16–21). Favorable trends in risk factors have been associated with the decline in mortality from ischemic heart disease, stroke, and from some other NCDs in Western countries (22).

There are many reasons for too slow positive changes in NCD risk profile in the Lithuania, some of them being reported by the CINDI research team and the National Health Board. The recent interim assessment of the implementation of Lithuanian Health Program demonstrated that, indeed, one of the most important barriers to improve NCD situation in the country is a lack of intersectoral collaboration for health (23, 24). Inequities in health, for example, as determined by some social inequalities, such as differences in educational attainment, are serious contributors to high prevalence of some RFs and consequently to increased NCD morbidity and mortality (19, 20, 25, 26). It is difficult to expect that CINDI program efforts, if not supported by actions from other sectors as described in Lithuanian Health Program, can on their own substantially improve NCD situation in the country (27).

Conclusions

The study showed the high prevalence of risk factors for noncommunicable diseases in Lithuanian rural population. A half of examined persons had hypertension and hypercholesterolemia. Every second man was regular smoker, every fifth – risky alcohol consumer. The majority of rural population was lacking leisure-time physical activity. Hypertension, smoking, and risky alcohol consumption was more common among men than among women while obesity and metabolic syndrome vice versa. The prevalence of hypertension, hypercholesterolemia, obesity, and metabolic syndrome increased with age both in men and women. The obtained data prove that comprehensive and intersectorial preventive actions aimed at the reduction in risk of noncommunicable diseases are urgently needed in Lithuania.

Lėtinių neinfekcinių ligų rizikos veiksnių paplitimas tarp Lietuvos kaimiškųjų rajonų gyventojų: CINDI programos tyrimas, 2007 m.

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Raktažodžiai: rizikos veiksniai, lėtinės neinfekcinės ligos, paplitimas, CINDI programa.

Santrauka. *Tyrimo tikslas.* Įvertinti lėtinių neinfekcinių ligų rizikos veiksnių paplitimą tarp Lietuvos kaimiškųjų rajonų gyventojų.

Tyrimo medžiaga ir metodai. Vykdant CINDI progamą, 2007 m. atliktas atsitiktinai atrinktų penkių Lietuvos rajonų 25–64 metų gyventojų sveikatos patikrinimas. Rizikos veiksniai nustatyti remiantis PSO rekomedacijomis. Sveikatos patikrinime dalyvavo 1739 žmonės.

Rezultatai. Arterinės hipertenzijos paplitimas tarp vyrų buvo didesnis nei tarp moterų (atitinkamai – 60,3 proc. ir 44,6 proc.). Hipercholesterolemija nustatyta pusei tirtųjų. Nutukusių moterų dalis buvo didesnė nei vyrų. Metabolinis sindromas nustatytas 15,1 proc. vyrų ir 21,5 proc. moterų. Labai skyrėsi vyrų ir moterų rūkymo (atitinkamai – 47,5 proc. ir 18,1 proc.) ir nesaikingo alkoholinių gėrimų vartojimo (26,7 proc. ir 3,1 proc.) dažnis. Dauguma gyventojų laisvalaikiu buvo nepakankamai fiziškai aktyvūs. Senstant didėjo arterinės hipertenzijos, hipercholesterolemijos, nutukimo ir metabolinio sindromo paplitimas. Rūkymas ir nesaikingas alkoholinių gėrimų vartojimas buvo dažnesni tarp jaunesnio nei tarp vyresnio amžiaus žmonių. Su amžiumi laisvalaikiu fiziškai aktyvių žmonių dalis didėjo.

Išvados. Lėtinių neinfekcinių ligų rizikos veiksnių paplitimas tarp kaimo gyventojų yra didelis. Siekiant sumažinti Lietuvos gyventojų riziką sirgti lėtinėmis ligomis, būtina įgyvendinti profilaktines programas, užtikrinančias efektyvų tarpžinybinį bendradarbiavimą.

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