Trends in main cardiovascular risk factors among middle-aged Kaunas population between 1983 and 2002

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Key words: *risk factors, mean values, prevalence, trends.*

Summary. *Objective of the study – to evaluate dynamics in prevalence of main risk factors of cardiovascular diseases among middle-aged Kaunas population between 1993 and 2002.*

Material and methods. Four independent surveys in 1983–1984, 1986–1987, 1992–1993, and 2001–2002 were carried out in random samples of men and women aged 35–64 involving 2413, 1762, 1231 and 1403 persons respectively. The risk factors were defined within the framework of the WHO MONICA study (Multinational Monitoring of Trends and Determinants in Cardiovascular Disease).

Results. During the 19 years the mean values of systolic blood pressure decreased among men. Among women decreased both mean values of systolic and diastolic blood pressure, however the prevalence of hypertension has decreased only among women by 11.9%, with no significant changes among men. The prevalence of overweight decreased among men, and the prevalence of obesity declined among women. Among women the body mass index decreased as well. No changes in the prevalence of hypercholesterolemia among men (80.7%) as well as among women (82.7%) have been detected, meanwhile the mean of total cholesterol among men increased from 5.9 mmol/l to 6.1 mmol/l and among women – from 6.09 mmol/l to 6.31 mmol/l ($p<0.001$). The prevalence of smoking has increased by 7.2% among women and didn't change among men.

In conclusion, the decreasing trends in the prevalence of some risk factors have been estimated in Kaunas middle-aged population during 1983–2002 years. However the profile of cardiovascular disease risk factors is still rather high. Programs or strategies targeted to control levels of main cardiovascular disease risk factors are urgently needed.

Introduction

The chronic noncommunicable diseases (NCD), particularly cardiovascular disease (CVD) still remains the leading causes of death. Coronary heart disease (CHD) and stroke are the main causes in the mortality structure among middle-aged Lithuanian population (1, 2). The treatment of these diseases, control of risk factors and prevention there are the main goal of the strategy related to the decline of CHD mortality (3). Continued assessment of temporal trends in risk factors is needed to inform population strategies to reduce risk and predict the future burden of CVD. The data of the Kaunas Rotterdam (KRIS) cohort study (4, 5) as well as the data of other prospective studies (6–9) reported the arterial hypertension, smoking, lipid disorders, and obesity as the main predictors of CHD. There is evidence that decline in the prevalence and levels of major CVD risk factors are related with reduction of CVD in the same population (10, 11). The main goal of the WHO MONICA study (Multinational Monitoring of Trends and Determinants in Cardiovascular Disease) was monitoring of levels and trends in CHD, stroke, and risk factors in men and women (12). Kaunas city was involved in this study since 1983.

Objective of this study was to describe trends in cardiovascular risk factors among middle-aged Kaunas population between 1983 and 2002.

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Material and methods

In the framework within the MONICA study in 1983–2002, four random samples of subjects aged 35–64 were selected. The Kaunas population register was used. The samples were stratified by age and sex so that at least 200 male and 200 female would be screened in every 10-year age group (35–44, 45–54, and 55–64). Four population-based surveys of 2,444, 1,762, 1,231, and 1,403 adults aged 35–64 were conducted in 1983–1984, 1986–1987, 1992–1993, and 2001–2001. Response rate for the first survey was 70.2%, for the second – 69.6%, for the third – 58.6%, and for the fourth – 62.4%. Every survey included physical measurements (blood pressure, height, body weight, hip and waist circumference), taking blood samples (for serum cholesterol levels), and face-to-face interview by the research staff for information on smoking. Smoking habits were determined via interviews adjusted to a large-scale population studies, using a standard questionnaire. For risk factors detection and evaluation the methodology of the MONICA study was applied (12).

Smoking. Standard questionnaire on smoking included questions about smoking behavior (regular smoker, ex-smoker, never-smoker, and occasional smoker), type of smoked tobacco (cigarettes, pipe, cigars), number of cigarettes smoked per day. Subjects who smoked at least one cigarette per day were considered to be regular smokers.

Overweight and obesity. Weight was measured to the nearest 0.2 kg with a balance scales with subjects wearing light clothing and without shoes. Height was measured to the nearest 0.5 centimeter, with subjects not wearing shoes. Waist and hip circumference was measured to a nearest 0.5 cm. We used body mass index (BMI) – body weight (kg) divided by height squared (m^2) to determine and classify body weight: underweight – BMI<18.5 kg/m^2, normal weight – BMI 18.5–24.9 kg/m^2, overweight – BMI 25.0-29.9 kg/m^2, obesity – BMI≥30.0 kg/m^2. Central obesity: waist-hip ratio for men ≥0.95, for women ≥0.80.

Arterial hypertension (AH). Standard mercury sphygmomanometers were used for the blood pressure (BP) measurements. BP was measured from the right arm of the subject after 5 minutes rest in a sitting position. The fifth phase of Korotkoff sounds was recorded as diastolic BP. The mean of two readings was used. Systolic BP≥140 mm Hg or/and diastolic BP≥90 mmHg, or normal BP (<140/90 mm Hg) if the person had taken antihypertensive drugs within the last two weeks was considered as arterial hypertension.

Hypercholesterolemia (HCh). Total serum cholesterol concentration was measured from a venous blood sample taken after at least 12-hour fast. Cholesterol was determined with an enzymatic (CHOD-PAP) method (13). Serum total cholesterol level ≥5.0 mmol/l was classified as hypercholesterolemia.

The age structure of European population aged 35–64 years was used as a standard for standardization of analyzed rates and mean values of parameters (14). Trend analysis using linear regression was conducted to evaluate blood pressure, total cholesterol, BMI, number of smoked cigarettes per day changes over time. Age of subject and number of sample were included as independent variables. Mean values of parameters and proportions of risk factors of the first and last samples were compared using t and z tests. For the statistical analysis the packages SPSS and Epi-Info were used. Statistical analysis was performed by personal computers in the Institute of Cardiology, Kaunas University of Medicine.

Results

The mean values of studied health indicators among middle-aged Kaunas population in four population-based surveys were analyzed. The results are presented in Table. Data analyzed revealed that among men systolic BP fell consistently in 2001–2002 as compared to 1983–1984 (136.4 mmHg v.s 138.9 mmHg, $p<0.01$), whereas the trend in diastolic BP was inconsistent. BMI decreased substantially in 1992–1993 but according to the data of fourth survey the mean of BMI among men was 27.4 kg/m^2 and there was no difference as compared with 1983–1984. However, the mean value of weight has increased ($p<0.01$). The WHO MONICA study started to measure waist and hip circumference in the 1992–1993 survey. Obtained data revealed that in men the mean value of hip circumference decreased in 2001–2002 as compared to1992–1993 ($p<0.001$). Total serum cholesterol level increased from 5.95 mmol/l in 1983–1984 to 6.11 mmol/l in 2001–2002 ($p<0.05$). Among current smokers daily cigarette consumption increased in 1986–1987 ($p<0.05$), but no statistically significant changes were observed in 2001–2002 ($p=0.06$).

Systolic blood pressure fell consistently through all surveys among women. The decline in diastolic

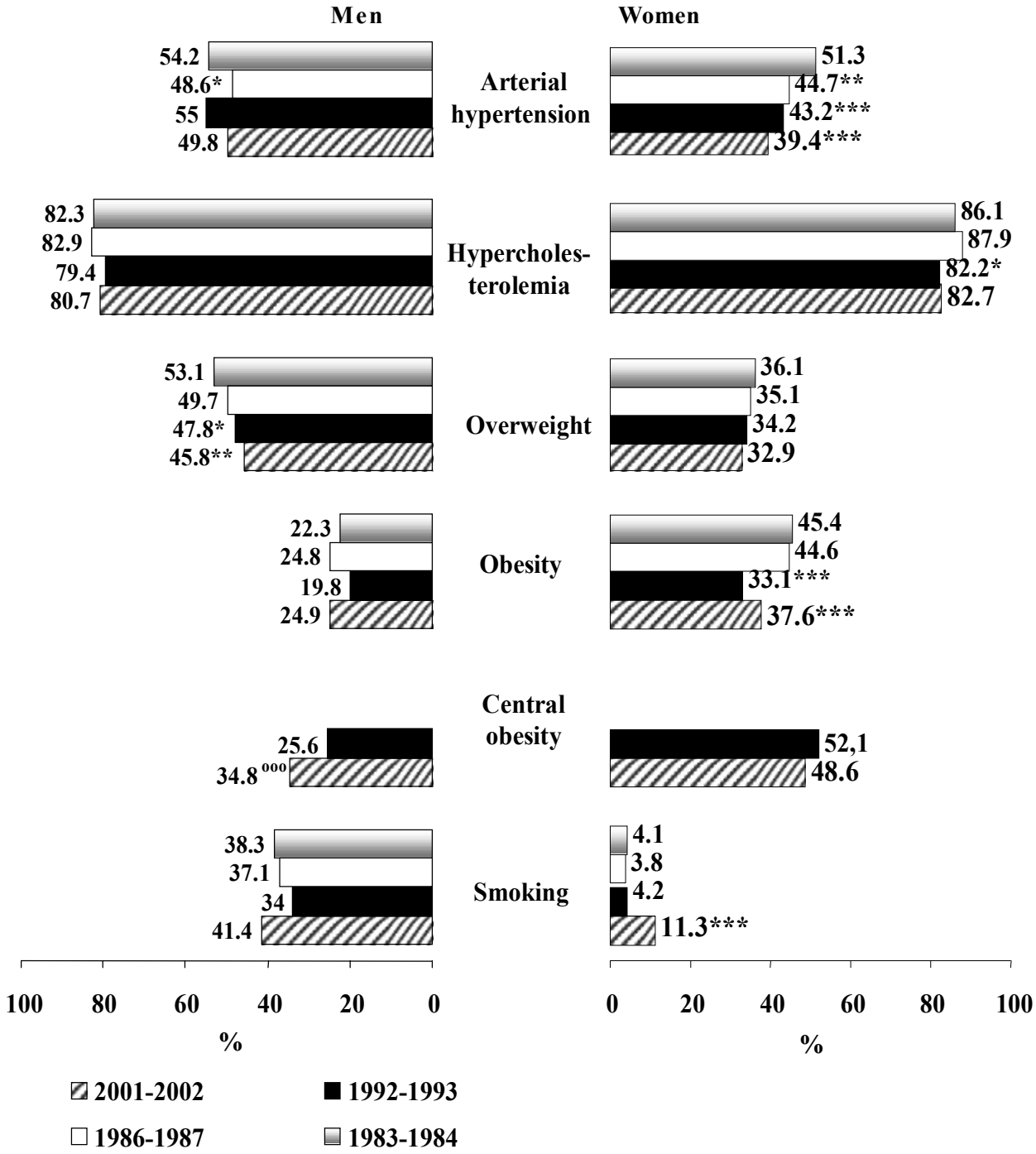
Table. **Age-adjusted mean values of study variables by sex and year**

Study variables and sex	Year			
	1983–1984	1986–1987	1992–1993	2001–2002
Men				
Blood pressure:	(n=1114)	(n=894)	(n=611)	(n=626)
systolic, mm Hg	138.9	136.2**	138.3	136.4*
diastolic, mm Hg	87.9	87.0	88.9	87.1
Body mass index,	(n=1162)	(n=894)	(n=610)	(n=626)
kg/m^2	27.5	27.5	27.1*	27.4
Weight, kg	82.5	83.0	82.9	84.4**
Waist circumference, cm	–	–	91.9	92.1
Hip circumference, cm	–	–	100.9	99.4°°°
Cholesterol, mmol/l	(n=869)	(n=851)	(n=596)	(n=622)
	5.95	5.99	5.94	6.11*
Number of cigarettes smoked per day	(n=1163)	(n=894)	(n=611)	(n=627)
(among regular smokers)	14.8	15.4*	14.6	15.7
Women				
Blood pressure:	(n=1231)	(n=868)	(n=628)	(n=775)
systolic, mm Hg	139.7	135.3***	135.9**	133.2***
diastolic, mm Hg	86.5	84.2***	86.6	82.7***
Body mass index,	(n=1282)	(n=868)	(n=621)	(n=777)
kg/m^2	30.0	29.8	28.2***	28.9***
Weight, kg	76.6	77.0	74.1***	75.6
Waist circumference, cm	–	–	84.7	84.7
Hip circumference, cm	–	–	105.1	104.5
Cholesterol, mmol/l	(n=960)	(n=840)	(n=615)	(n=776)
	6.09	6.32***	6.27*	6.31***
Number of cigarettes smoked per day	(n=1287)	(n=868)	(n=628)	(n=777)
(among regular smokers)	9.6	7.6	7.0	8.6

* $p<0.5$. ** $p<0.01$. *** $p<0.001$ compared with the 1983–1984.
°°° $p<0.001$. compared with the 1992–1993.

blood pressure was observed in the second and in the fourth surveys as compared with the first survey ($p<0.001$). The BMI decreased from 30.0 kg/m^2 in 1983–1984 to 28.9 in 2001–2002 ($p<0.001$) body weight, the waist and hip circumference among women have not changed between 1983–1984 and 2001–2002. Serum total cholesterol increased from 6.09 mmol/l in 1983–1984 to 6.31 mmol/l in 2001–2002 ($p<0.001$). Among current smokers number of cigarettes smoked per day didn't show any change.

Some changes were observed in the prevalence of studied risk factors (Figure). The prevalence of hypertension decreased in 1986-1987 and no further decline in the last surveys was found. The prevalence of hypertension among women decreased significantly across the four surveys from 51.3% in 1983–1984 to 39.4% in 2001–2002 ($p<0.001$). The prevalence of hypercholesterolemia in men was without changes between 1983–1984 and 2001–2002 (82.3% – 80.7%). In women the decrease in the prevalence of hypercholesterolemia



* p<0.05, ** p<0.01, *** p<0.001 compared with 1983–1984.
ooo p<0,001 compared with 1992–1993.

Fig. **Age-adjusted prevalence of main cardiovascular risk factors by sex and year**

was observed in 1992–1993, as compared to 1983–1984. The prevalence of overweight decreased significantly among men in 1992–1993 by 5.3% (95% CI 0.41–10.2 %) and in 2001–2002 by 7.3% (95% CI 2.5–12.1%) as compared to 1983–1984. There was no overall change in prevalence of overweight in women. The age-adjusted prevalence of obesity remain without changes in men and showed a sig-

nificant decline among women in 1992–1993 by 12.3% (95% CI 7.7–16.9%), and 2001–2002 by 7.8% (95% CI 3.4–12.2%), respectively, as compared to 1983–1984.

Central obesity among men between last two surveys increased more than 4% ($p<0.05$) and no trend was found among women. During the 19 years the prevalence of smoking dramatically increased among women from 4.1% to 11.3% ($p<0.001$) and did not change among men. The data obtained by linear regression model revealed slight decreasing trend in systolic and diastolic BP among men ($\beta= -0.583$and $\beta= -0.015$, $p>0.05$, respectively) and significant decreasing trend among women ($\beta= -0.96$ and $\beta= -0.93$, $p<0.001$, respectively). Decline of BMI was observed among women ($\beta= -0.463$, $p<0.001$), and no remarkable changes among men ($\beta= -0.07$, $p>0.05$). Over the analyzed period of time the level of total cholesterol increased in men ($\beta=0.04$, $p<0.05$) as well as in women ($\beta=0.93$ $p<0.01$). No remarkable changes were observed in the number of smoked cigarettes per day among regular smokers both among men and women ($\beta=2.07$ and $\beta=0.553$, $p>0.05$, respectively).

Discussion

The obtained data indicate that during 19 years changeable trends in cardiovascular risk factors among Kaunas middle-aged population were observed. Our data noted improvements in systolic and diastolic BP levels among women, and in systolic BP only among men. Declining trends in BMI among women as well as in the prevalence of obesity were revealed in 1992–1993 and 2001–2002. Slight decrease in BMI ($p<0.05$) was found among men in 1992–1993 only, however in the latest year the BMI remained without changes, whereas the weight roused ($p< 0.01$). The decreasing trend of obesity and AH among women confirms the widespread recognition of the association between blood pressure level and BMI (15).

There was observed an increase in total serum cholesterol level in men as well as in women without changes in prevalence of hypercholesterolemia. These data demonstrated that in study population the part of subjects with high levels of total cholesterol increased. The high level of total cholesterol may have large proportion of population having central obesity (16). In 2001–2002 among our study population prevalence of central obesity was 34.8% in men and 48.6% in women.

In spite of reported data about declining trends in dietary fat consumption and increasing trends in fruits and vegetables consumption among Lithuanian adults (17) as well as in the middle-aged Kaunas population (unpublished data) and elderly (17, 18), HCh remained the most prevalent risk factor among our studied population. Whereas, recent data from CINDI project in Lithuania revealed remarkable decline in the prevalence of HCh among rural population aged 25-64 years between 1987 and 1999: the prevalence of HCh decreased in men by 23.2 %, and in women by 19.9 % (19). It was the most favorable trend compared with changes in prevalence of AH and obesity.

There are reported data that smoking prevalence among women in Lithuania in the recent decade increased (17, 19). Our results confirmed this information: during 1983–2002 the proportion of regular smokers among women in Kaunas increased from 4.1% to 11.3%, without changes in the prevalence of smoking among men. The data reported by other epidemiological studies are controversial. Some of the studies have reported on substantial decline in the prevalence of smoking in the recent two decades, particularly among men with high education (20–22), whereas other ones showed decreasing trend among men and increasing trend among women (23, 24). In North Karelia (Finland) during the 1972–1993 the smoking prevalence among men aged 30–59 years decreased by 20% and increased among women by 7% (25). The unfavorable socioeconomic conditions, unemployment, low salaries, stressful situations etc., as well as intensive advertising of tobacco products may explain the increasing trends in smoking prevalence among Lithuanian women.

In conclusion, the changeable trends in the prevalence in cardiovascular risk factors have been estimated in Kaunas middle-aged population during 1983–2002 years. However the profile of CVD risk factors is still rather high. These findings suggest that the population burden of CVD may increase in the near future. Programs or strategies targeted to control levels of main CVD risk factors are urgently needed.

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Širdies ir kraujagyslių ligų svarbiausių rizikos veiksnių pokyčiai tarp vidutinio amžiaus Kauno gyventojų 1983–2002 metais

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Raktažodžiai: rizikos veiksniai, vidutinės reikšmės, paplitimas, pokyčiai.

Santrauka. Darbo tikslas. Įvertinti širdies ir kraujagyslių ligų svarbiausių rizikos veiksnių pokyčius tarp vidutinio amžiaus Kauno gyventojų 1983–2002 m. Keturių atsitiktinių imčių sveikatos patikrinimai atlikti 1983–1984, 1986–1987, 1992–1993 ir 2001–2002 metais. Ištirta 35–64 metų gyventojų: 2413, 1762, 1231, 1403. Tyrimas atliktas vykdant tarptautinę MONICA studiją (Multinational Monitoring of Trends and Determinants in Cardiovascular Disease). Taikyti standartiniai epidemiologinio tyrimo metodai. Nustatyta, kad per tiriamąjį laikotarpį sumažėjo vyrų sistolinio arterinio kraujospūdžio vidurkis, o moterų sumažėjo ir sistolinio, ir diastolinio arterinio kraujospūdžio vidurkis. Tačiau arterinės hipertenzijos paplitimas sumažėjo 11,9 proc. (95 proc. pasikliautinasis intervalas PI 7,5–16,3 proc.) tik tarp moterų ir nepakito tarp vyrų. Antsvorio paplitimas sumažėjo tarp vyrų, o nutukimo – tarp moterų. Sumažėjo moterų kūno masės indeksas. Centrinio nutukimo paplitimas tarp vyrų padidėjo 9,3 proc. (95 proc. PI 4,2–14,4 proc.) ir nekito tarp moterų. Hipercholesterolemijos paplitimas išliko didelis (80,7 proc. tarp vyrų ir 82,7 proc. tarp moterų) ir per tiriamąjį laikotarpį nekito. O bendrojo cholesterolio vidutinės reikšmės tarp vyrų padidėjo nuo 5,9 mmol/l iki 6,1 mmol/l ($p<0,05$), tarp moterų – nuo 6,09 mmol/l iki 6,31 mmol/l ($p<0,001$). Rūkymo paplitimas tarp moterų padidėjo 7,2 proc. (95 proc. PI 4,7–9,7 proc.), tarp vyrų nepakito. Duomenys rodo, kad širdies ir kraujagyslių ligų profilaktikos programos turėtų būti efektyvesnės.

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