Original Research

High-Risk Profile in a Region with Extremely Elevated Cardiovascular Mortality

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Background: Although mortality rates from cardiovascular diseases have shown a remarkable decline in many western countries, cardiovascular mortality in Lithuania has remained high. It is widely accepted that half of the decline in cardiovascular mortality can be attributed to favourable changes in modifiable risk factors.

Methods: In 2006, the Lithuanian High Cardiovascular Risk Programme was started. A two-level approach—primary health care institutions and specialised cardiovascular prevention units—was applied. The cardiovascular risk profile was evaluated for a group of 17,031 middle-aged subjects enrolled into the programme at a primary level and 2908 at a specialised level.

Results: Among the persons examined, 61.8% (10,519) were female. Arterial hypertension was present in 60.2% of the subjects. Dyslipidaemia was present in 88.8%. Total cholesterol was 6.02 ± 1.23 mmol/L, LDL cholesterol 3.74 ± 1.09 mmol/L, HDL cholesterol 1.53 ± 0.52 mmol/L, and triglycerides 1.61 ± 1.27 mmol/L. Diabetes mellitus was found in 10.3%, abdominal obesity in 45.4%, and metabolic syndrome in 43.8% of cases. These values were even greater in high-risk subjects.

Conclusions: In middle-aged subjects the prevalence of dyslipidaemia, arterial hypertension, diabetes, and metabolic syndrome was found to be high. We can roughly state that almost nine out of ten middle-aged subjects in Lithuania have established dyslipidaemia, every second one has established arterial hypertension, and four out of ten are obese. Hence, these are the main risk factors that should be considered first of all in daily clinical practice.

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In Lithuania, as in the most other developed or developing countries, cardiovascular diseases (CVD) still remain the leading cause of death, with high morbidity and disability.[1] As compared to the western European countries, the curve of cardiovascular mortality has not declined until recently.[2] In Lithuania, people die from CVD nearly twice as often as the average in the western European Union countries.

Atherogenesis begins in childhood and develops in populations at different rates according to environmental factors. Patients with hypertension, dyslipidaemia, diabetes mellitus (DM), a family history of premature coronary heart disease (CHD), or a combination of these risk factors are at high risk of developing CHD or other atherosclerotic disease.[3] Although any major risk factor left untreated has the potential to lead to CHD, a very important concept is that multiple risk factors tend to increase the risk synergistically. It has been estimated that nearly half of the decline in cardiovascular mortality is due to earlier diagnosis and more aggressive treatment of CVD, while the remain-

ing half is attributable to favourable changes in the profile of risk factors, such as the decline in cigarette smoking and the aggressive management of blood pressure and lipids.[4,5] A comprehensive action for CHD prevention should include three components: a population strategy, a high-risk strategy and the prevention of recurrent CHD events.[6]

When analysing the situation regarding clinically oriented primary cardiovascular prevention in Lithuania within the period 2003-2005, we identified very low activity in this field. Despite the positive changes in adult smoking prevalence in Lithuania,[7] the cardiovascular risk of the population in Lithuania still remains high. Extremely low rates of blood pressure control, a high prevalence of dyslipidaemia and limited use of lipid lowering medication, unhealthy eating habits and low level of regular physical activity are typical of the Lithuanian population.[8,9] The aim of our study was to develop a clinically oriented nationwide programme for the assessment of cardiovascular risk in subjects of employable age without overt CVD, with a view to pursuing aggressive modification of risk factors in those with elevated risk.

Methods

Population enrolled and logistics of the programme

The Lithuanian High Cardiovascular Risk (LitHiR) Primary Prevention Programme, reimbursed by the Statutory Health Insurance Fund, started in 2006. The Local Research Ethics Committee's approval was obtained. In the LitHiR programme men aged 40-54 years and women aged 50-64 years without overt CVD were recruited. The exclusion criteria were: a) proven (clinically evident) CHD; b) proven (clinically evident) cerebrovascular disease; c) proven (clinically evident) peripheral artery disease; d) end-stage oncological disease; e) any other end-stage somatic disease. A two-level approach—primary health care institutions (PHCI) and specialized cardiovascular prevention units (CVPU)—was applied. Participants enrolled into the programme by PHCI underwent physical examination, risk profile and lifestyle analysis (smoking, physical activity, dietary patterns), recording of personal and family patterns for CVD in first-degree blood relatives, anthropometry (height, weight, waist circumference, and body mass index [BMI], defined as weight in kilograms divided by height in square meters), and blood pressure and pulse determination. For all participants 12-lead electrocardiograms (ECG) were recorded. Serum total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), triglycerides (TG), and calculated low-density lipoprotein cholesterol (LDL-C) were determined, and plasma glucose was sampled for the estimation of fasting blood glucose levels. The overall cardiovascular risk according to the risk estimation SCORE (Systematic Coronary Risk Evaluation) system was calculated.[10]

High-risk subjects were referred to a CVPU by their primary physician for additional examination, reassessment of their risk, and provision of recommendations for cardiovascular prevention and treatment of the risk factors. A detailed description of the LitHiR programme protocol was published earlier.[11] Arterial hypertension was defined as a systolic blood pressure ≥140 mmHg and/or a diastolic blood pressure ≥90 mmHg, or a diagnosis of hypertension documented in a medical record. Dyslipidaemia was defined as TC>5 mmol/L, or LDL-C>3 mmol/L, or HDL-C<1.0 mmol/L in men or <1.2 mmol/L in women, or TG >1.7 mmol/L. Metabolic syndrome (MS) was assessed according to the National Cholesterol Education Program III modified criteria.[12]

This report describes the analysis of the cardiovascular risk profile in a group of 17,031 subjects enrolled into the programme on the primary level from 2009 to 2011. In addition, we analysed 2908 electronic records of high-risk persons' data available at Vilnius University Hospital Santariškių Klinikos.

Data collection and statistical analysis

For continuous variables the following descriptive statistics are reported: means, standard deviations (SD), and 95% confidence intervals (CI). For categorical data frequencies are reported. In the case of dichotomous categorical variables we also provide confidence intervals for proportions of interest (e.g. diabetes, smoking, etc.). These intervals were obtained using the relationship between beta and binomial distributions. Continuous variables were compared using the t-test or the Mann–Whitney test. Categorical variables were compared using the chi-square test. All reported p-values are two-tailed. The level of significance was set at 0.05.

Results

Since July 2009, general practitioners at PHCI have been filling the specially designed protocols. By 2011, 17,031

protocols were available as electronic documents. The data presented are based on the analysis of this data.

PHCI sample

The whole PHCI sample consisted of 17,031 persons. Summary statistics for continuous and categorical variables are presented in Table 1. In brief, the mean age of the participating patients was 53.09 ± 6.00 years, 61.8% (10,519) were females, 60.2% had arterial hypertension, 10.3% had DM, 21.5% were current smokers, and 43.8% had MS. In this study we found a very high prevalence of dyslipidaemia (88.8%). Based on our data, 12,694 (75.7%; 95% CI: 75.0-76.3%) subjects had high LDL-C, whereas only 2733 (16.2%; 95% CI: 15.7-16.8%) patients had low HDL-C (<1.0 mmol/L for men, <1.2 mmol/L for women). Unhealthy nutrition was present in 60.5% (95% CI: 59.7-61.2%) of patients. The prevalence of insufficient physical activity in the whole sample was 50.2% (95% CI: 49.5-51.0%). Men were more active than women (54.3% of women and 43.6% of men were insufficiently active, p<0.001). A family history of CHD was present in 24.5% of men and 25.7% of women (p=0.043; overall 25.2%). A positive family history of DM was reported by 12.0% of patients.

In Table 1, summary characteristics for males and females are presented separately. The tendencies in both groups were the same as in the whole group, although in most cases men seemed rather better. This could be explained by the age differences between groups.

When analysing subjects for their cardiovascular risk, we attempted to classify them into high and mild-moderate risk categories (as defined previously).[11] Almost half of the subjects (47.5%) were in the high-risk category and 52.5% were in the category of mild-moderate risk.

CVPU level

The analysis of the high-risk persons' data available at Vilnius University Hospital Santariškių Klinikos was based on 3882 electronic records available up to January 12, 2011. Of the subjects referred to the CVPU by the PHCI, 74.9% fulfilled the criteria of high risk determined by the programme. Consequently, the final dataset included 2908 subjects.

The analysis followed the same pattern as in the PHCI group. Results are presented in Table 2. The age of the participating patients was 54.05 ± 6.06 years, and 57.17% (1917) were females. We docu-

Table 1. Characteristics of the whole study group. Risk factors.

	Total (n=17,031) Mean ± SD (95% CI)		Women (n=10,519)* Mean ± SD (95% CI)		Men (n=6512)* Mean ± SD (95% CI)	
Age (years)	53.09 ± 6.00	(53.00-53.18)	56.49 ± 4.19	(56.41-56.57)	47.61 ± 4.14	(47.51-47.71)
Arterial hypertension (%)	60.2	(59.4-60.9)	65.0	(64.0-65.9)	52.4	(51.1-53.6)
Dyslipidaemia (%)	88.8	(88.3-89.3)	90.6	(90.1-91.2)	85.9	(85.1-86.8)
Diabetes mellitus (%)	10.3	(9.8-10.7)	10.7	(10.1-11.3)	9.6	(8.9-10.3)
Abdominal obesity (%)	45.4	(44.6-46.2)	53.9	(52.9-54.9)	31.6	(30.4-32.8)
BMI ≥30 kg/m^2 (%)	38.2	(37.5-38.9)	43.2	(42.3-44.2)	30.0	(28.9-31.2)
Current smokers (%)	21.5	(20.9-22.1)	8.7	(8.2-9.3)	42.1	(40.9-43.3)
MS (%)	43.8	(42.9-44.8)	50.3	(49.0-51.5)	34.4	(32.9-35.8)
Waist circumference (cm)	94.32 ± 13.81	(94.11-94.53)	92.57 ± 14.05	(92.30-92.84)	97.14 ± 12.94	(96.82-97.46)
BMI (kg/m^2)	29.13 ± 5.56	(29.05-29.22)	29.74 ± 5.93	(29.63-29.86)	28.14 ± 4.76	(28.03-28.26)
SBP (mmHg)	135.50 ± 17.62	(135.23-135.78)	136.43 ± 18.16	(136.07-136.80)	133.99 ± 16.5	(133.57-134.41)
DBP (mmHg)	83.46 ± 9.63	(83.31-83.61)	83.47 ± 9.65	(83.27-83.66)	83.46 ± 9.59	(83.22-83.70)
HR (beats/min.)	72.74 ± 8.33	(72.60-72.88)	73.02 ± 8.05	(72.85-73.18)	72.29 ± 8.75	(72.06-72.53)
Fasting glucose (mmol/L)	5.44 ± 1.24	(5.42-5.45)	5.40 ± 1.18	(5.38-5.42)	5.49 ± 1.32	(5.46-5.53)
TC (mmol/L)	6.02 ± 1.23	(6.01-6.04)	6.16 ± 1.20	(6.14-6.18)	5.81 ± 1.23	(5.78-5.84)
LDL-C (mmol/L)	3.74 ± 1.09	(3.73-3.76)	3.83 ± 1.09	(3.81-3.86)	3.60 ± 1.06	(3.57-3.62)
HDL-C (mmol/L)	1.53 ± 0.52	(1.53-1.54)	1.61 ± 0.51	(1.61-1.62)	1.40 ± 0.52	(1.39-1.42)
TG (mmol/L)	1.61 ± 1.27	(1.59-1.63)	1.49 ± 0.95	(1.48-1.51)	1.80 ± 1.63	(1.76-1.84)
SCORE	2.07 ± 1.83	(2.04-2.09)	1.97 ± 1.65	(1.94-2.00)	2.22 ± 2.09	(2.17-2.28)

*Men and women did not differ with respect to DBP (p=0.462); they differed significantly with respect to diabetes mellitus at level 0.05 (p=0.031) and differed significantly with respect to all other variables at level 0.001.
BMI – body mass index; MS – metabolic syndrome; SBP – systolic blood pressure; DBP – diastolic blood pressure; HR – heart rate; TC – total cholesterol; LDL–C – low density lipoprotein cholesterol; HDL-C – high density lipoprotein cholesterol; TG – triglycerides.

Table 2. Characteristics of the whole high-risk sample.

	Total (n=2908) Mean ± SD (95% CI)		Female (n=1917) Mean ± SD (95% CI)		Male (n=991) Mean ± SD (95% CI)	
Age (years)	54.05 ± 6.06	(53.83-54.27)	57.17 ± 4.22	(56.99-57.36)†	48.02 ± 4.27	(47.75-48.28)
Arterial hypertension (%)	86.1	(84.9-87.4)	85.9	(84.3-87.4)	86.6	(84.5-88.7)
Dyslipidaemia (%)	96.8	(96.1-97.4)	97.0	(96.2-97.7)	96.4	(95.2-97.5)
Diabetes mellitus (%)	15.5	(14.2-16.8)	14.9	(13.3-16.5)	16.7	(14.4%-19.0%)
Abdominal obesity (%)	79.6	(78.1-81.0)	85.2	(83.6%-86.8%)†	68.7	(65.8%-71.6%)
BMI ≥30 kg/m² (%)	52.5	(50.7-54.3)	51.9	(49.6%-54.1%)	53.8	(50.7%-56.9%)
Current smokers (%)	23.3	(21.8-24.9)	13.5	(12.0%-15.0%)†	42.3	(39.2%-45.4%)
MS (%)	55.7	(53.9-57.5)	55.2	(53.0%-57.4%)	56.7	(53.6%-59.8%)
Waist circumference (cm)	103.24 ± 12.40	(102.79-103.69)	101.01 ± 12.36	(100.46-101.56)†	107.55 ± 11.31	(106.85-108.26)
BMI (kg/m²)	30.79 ± 5.18	(30.60-30.98)	30.76 ± 5.47	(30.51-31.00)	30.85 ± 4.59	(30.57-31.14)
SBP (mmHg)	155.45 ± 20.89	(154.69-156.21)	155.44 ± 21.71	(154.47-156.41)	155.48 ± 19.21	(154.29-156.68)
DBP (mmHg)	95.82 ± 11.58	(95.40-96.25)	94.54 ± 11.24	(94.03-95.04)†	98.32 ± 11.83	(97.58-99.06)
HR (beats/min.)	67.35 ± 11.69	(66.92-67.77)	67.44 ± 11.50	(66.93-67.96)	67.16 ± 12.04	(66.41-67.91)
Fasting glucose (mmol/L)	6.04 ± 1.60	(5.98-6.10)	5.92 ± 1.67	(5.84-5.99)†	6.27 ± 1.42	(6.18-6.36)
TC (mmol/L)	7.12 ± 2.08	(7.05-7.20)	7.26 ± 1.73	(7.19-7.34)†	6.85 ± 2.61	(6.69-7.01)
LDL-C (mmol/L)	4.70 ± 1.30	(4.65-4.74)	4.90 ± 1.27	(4.84-4.96)†	4.30 ± 1.27	(4.23-4.38)
HDL-C (mmol/L)	1.46 ± 2.94	(1.35-1.56)	1.52 ± 2.32	(1.42-1.62)†	1.33 ± 3.86	(1.09-1.58)
TG (mmol/L)	2.30 ± 2.87	(2.19-2.40)	1.95 ± 2.42	(1.85-2.06)†	2.96 ± 3.48	(2.75-3.18)
SCORE	2.58 ± 2.80	(2.48-2.69)	2.46 ± 2.88	(2.33-2.59)	2.83 ± 2.62	(2.67-3.00)

*p<0.05 compared with men; †p<0.001 compared with men.
MS – metabolic syndrome; BMI – body mass index; SBP – systolic blood pressure; DBP – diastolic blood pressure; HR – heart rate; TC – total cholesterol; LDL-C – low density lipoprotein cholesterol; HDL-C – high density lipoprotein cholesterol; TG – triglycerides.

mented a very high prevalence of hypertension (86.1%), dyslipidaemia (96.8%), and abdominal obesity (79.6%) in this high-risk group. Overall, more than half (55.7%) of the population had MS, whose presence augmented CVD morbidity and mortality, while 23.3% were current smokers. A family history of CHD was present in 56.9% of men and in 52.7% of women (p<0.001 compared with men; overall 54.2%), while 8.4% of patients reported a positive family history of DM.

Discussion

Early diagnosis and correction of CVD risk factors is necessary in order to prolong human life and reduce morbidity.[2] Not only should cardiologists be involved in solving this issue, but also the efforts of society and every resident of the country are crucial. To reduce the epidemic of CVD in Lithuania and all around the world, the first step is to estimate the prevalence of the risk factors. Only then can risk-factor correction programmes be developed and relevant medicine compensation schemes be created. Hypertension, dyslipidaemia, smoking, and diabetes are responsible for 32.7%, 15.1%, 10.4% and 16.4% of CVD risk, respectively.[13] These four risk factors account for 57.7% (57.0-58.4%) of CVD risk, representing a 10-year excess risk of CVD death of 5.66% (5.47-5.85%). Risk factors for CVD are widespread in Europe and all around the world, but correction has been successful in only a small group of patients.[14-16] Several epidemiological studies that estimated the prevalence of risk factors in specific populations were carried out in Lithuania (MONICA, CINDI projects), but the prevalence of risk factors should be monitored constantly, as the profile of the risk can change.[9,17] Furthermore, results of epidemiological research do not always correspond with the data from observation-intervention programmes.

Based on this rationale, the observation-intervention LitHiR programme for identification and prevention of high cardiovascular risk persons was started in Lithuania in 2006. The number of PHCIs taking part in this programme is 385/420, comprising 91.6% of all PHCIs in Lithuania.[11] Within the period 2006-2010, a total of 266,391 patients (36.9% of the target population) were examined.

Hypertension is the leading cause of CVD worldwide. The rate of hypertension varies from 3.4% (among men) and 6.8% (among women) in India, to 68.9% (among men) and 72.5% (among women) in Poland, and to 72.7% in the EURIKA study.[18,19] Several factors (genetic, socio-demographic and environmental) may be responsible for this geograph-

ic pattern. Prior to 1990, population data suggested that the prevalence of hypertension was decreasing; however, recent data have shown that it is increasing again.[20] The prevalence of hypertension in Lithuania was always high, and varied from 60.3% to 78% among men and from 44.6% to 64% among women, depending on the region where the survey was conducted and on the age of the population.[9,17] During our study, hypertension was diagnosed in 60.2% of the middle-aged patients. The frequency of hypertension increases significantly from the age of 60. Therefore, its prevalence in Lithuania could be higher. Undoubtedly, clinical studies have proven the benefits of arterial hypertension treatment. However, its correction and efforts to reach target blood pressure norms are rarely successful in everyday practice. According to data from the CINDI study, blood pressure control was successful only for a small fraction of patients with hypertension (2.6% of men and 5.3% of women) in Lithuania. The preliminary data from the LitHiR programme indicate that the control of hypertension is at 30% or higher since the programme started.

Dyslipidaemia, elevated levels of LDL-C in particular, is a significant CVD risk factor. The treatment of dyslipidaemia can reduce the risk of heart disease by 30% over a five-year period.[21] The prevalence of dyslipidaemia also depends on geography. In the United States, 15.0% of patients had levels of TC >6 mmol/L.[22] Other studies have shown a dyslipidaemia prevalence of 29.3%, varying from 21.0% in Chinese women to 36.9% in non-Hispanic white men.[23] According to the EURIKA study, the prevalence of dyslipidaemia in primary prevention subjects was 57.7%.[19] Elevated LDL-C was predominant, and varied from 59.6% to 75.7% in the GENOA study.[24] The decrease in HDL-C was estimated to be from zero to 14.7% of patients, while elevated TG levels varied from 16.6% to 53.2%.[24,26,27] The independent relationship of TG to the risk of future CVD events has long been controversial, yet lately it has been especially emphasised.[25] In Lithuania, dyslipidaemia was diagnosed in 52.2-81% of men and in 51.3-87% of women.[9,17] In the LitHiR study, as many as 88.8% of employable age residents have dyslipidaemia, which means almost nine patients out of ten. Elevated levels of TC were diagnosed in 80.5% (95% CI: 79.9-81.1%) and elevated levels of LDL-C in 75.7% (95% CI: 75.0-76.3%) of the middle-aged subjects. Although the TC and LDL-C levels were very high in the middle-aged individuals in Lithuania, a low level of HDL-C was diagnosed only in 16.2% of subjects. Elevated TG levels were found in 30.6% of the middle-aged patients (27.1% of women and 36.2% of men). Monitored dyslipidaemia had its particularities among our subjects: elevated levels of LDL-C and TG dominated, while low levels of HDL-C were less significant. Undertreatment of dyslipidaemia is a major public health challenge in Lithuania. According to the EUROASPIRE III study, in patients with CVD, treatment and correction of dyslipidaemia were among the lowest when compared with other European countries.[14] The level of TC<4.5 mmol/L was achieved in only 27.3% of patients, while the average for all the countries covered by the EUROASPIRE III study was 55%. The preliminary data from the LitHiR study suggested that within the treated dyslipidaemia group there were only 5.0% of patients with successfully managed dyslipidaemia.

According to the data provided by the World Health Organisation, globally there are more than one billion overweight adults, of whom at least 300 million are obese.[28] The increased number of obese individuals leads to a higher prevalence of MS,[21] which, in its turn, increases the risk of DM, CVD, and cardiovascular or total mortality. In the analyses carried out in the World Health Report 2002, approximately 58% of diabetes and 21% of CHD globally were attributable to a BMI above 21 kg/m^2.[28] The estimated prevalence of overweight and obesity in US adults was 67.3% in 2008, of whom 33.7% were obese (BMI>30 kg/m^2).[22] In the EURIKA study, 43.6% of patients were diagnosed with obesity.[19] Among Central and Eastern European hypertensive patients, abdominal obesity was diagnosed in 47.2%.[16] The prevalence of overweight in Lithuanian residents ranges from 61% to 80% among men and from 60.4% to 83% among women.[9,17] The data from our study revealed abdominal obesity in 45.4% of subjects, and obesity in 38.2% of the middle-aged patients, with an average BMI of 29.13 ± 5.56 kg/m^2. There is a significant correlation between obesity and MS. It is well known that MS increases the probability of cardiovascular death (by 2.6-4.2 times) and total mortality (by 1.9-2.1 times).[29,30] The NHANES III study revealed that in the United States MS was diagnosed in 23.1% of adults.[31] According to a study carried out in Greece, 23.6% of patients had MS (n=4753). Most of them (61%) had three MS components, 29% had four, and 10% had five.[32] The Finnish population survey (n=3495) revealed a 48.8% and 52.6% prevalence of MS in 1992 and 2002, respectively. Participants included in the analysis were mostly middle-

aged (45-64 years).[33] The BP-CARE survey showed that 40.4% of the patients had MS.[16] In Lithuania, the highest occurrence of MS was in the 55-64 year-old group, where the prevalence of MS was 22.3% among men and 37.5% among women.[34] The LitHiR study indicated an MS prevalence as high as 43.8% (95% CI: 42.9-44.8%) among middle-aged individuals. MS is closely related to DM type 2, whose prevalence is increasing very rapidly in the developed and developing countries.[35] Every year, seven million people are newly diagnosed with DM.[36] Epidemiological studies have proven that the number of people with DM had doubled during twenty years. In our study, DM was present in 15.5% (95% CI: 14.2-16.8%) of the middle-aged individuals (14.9% of women and 16.7% of men).

Smoking is one of the most important CVD risk factors. The INTERHEART study indicated that smoking increases the risk of myocardial infarction by three times.[37] Another study showed that smoking was highly related with left main CHD (odds ratio 7.5, $p<0.001$).[38] In the LitHiR study, only 21.5% (95% CI: 20.9-22.1%) of patients were current smokers (42.1% of men, 95% CI: 40.9-43.3%, and 8.7% of women, 95% CI: 8.2-9.3%). Eventually, this indicator determines the increase in the SCORE index. The need to evaluate patients' total risk according to the SCORE risk scale should be noted.[2] Data from our study indicated that smoking was not crucial among the middle-aged individuals in Lithuania. The SCORE index was rather small, because of the young age and the low prevalence of smoking. The average SCORE in our study was 2.07 ± 1.83 (95% CI: 2.04-2.09) and did not differ significantly between men and women.

Thus, the typical high-risk profile of the LitHiR subjects consists of a very high prevalence of hypertension (86.1%), dyslipidaemia (96.8%) and abdominal obesity (79.6%), with a relatively low prevalence of low HDL-C and smoking. We also note that patients with the classical MS signs should be reassessed in specialized prevention units for the estimation of their exact risk, using additional laboratory and arterial wall biomarkers. This enables us to determine subclinical atherosclerosis. These data will be presented in the near future.

It is important to be aware of several limitations of our results. The present study examined a sample of men aged 40-55 years and women aged 50-65 years. A future study is needed to examine younger and older samples. Some risk factors that are important in risk assessment, such as psychosocial factors, social class and others, were not taken into account. In addition, physical activity status, smoking and nutrition habits were assessed by self-reporting; therefore, some subjects may have been misclassified.

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References

1. De Backer G, Ambrosioni E, Borch-Johnsen K, et al. European guidelines on cardiovascular disease prevention in clinical practice. Third Joint Task Force of European and Other Societies on Cardiovascular Disease Prevention in Clinical Practice. Eur Heart J. 2003; 24: 1601-1610.
2. Graham I, Atar D, Borch-Johnsen K, et al. European guidelines on cardiovascular disease prevention in clinical practice: full text. Fourth Joint Task Force of the European Society of Cardiology and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of nine societies and by invited experts). Eur J Cardiovasc Prev Rehabil. 2007; 14 Suppl 2: S1-113.
3. Smith SC Jr, Jackson R, Pearson TA, et al. Principles for national and regional guidelines on cardiovascular disease prevention: a scientific statement from the World Heart and Stroke Forum. Circulation. 2004; 109: 3112-3121.
4. Capewell S, Morrison CE, McMurray JJ. Contribution of modern cardiovascular treatment and risk factor changes to the decline in coronary heart disease mortality in Scotland between 1975 and 1994. Heart. 1999; 81: 380-386.
5. Capewell S, Beaglehole R, Seddon M, McMurray J. Explanation for the decline in coronary heart disease mortality rates in Auckland, New Zealand, between 1982 and 1993. Circulation. 2000; 102: 1511-1516.
6. Wood D. Asymptomatic individuals-risk stratification in the prevention of coronary heart disease. Br Med Bull. 2001; 59: 3-16.
7. Dambrauskiene K, Veryga A, Klumbiene J, Petkeviciene J. Evaluation of smoking habits among Lithuanian adult population in 1994-2008, according to gender, age and education. Public Health. 2010; 1: 31-35.
8. Klumbiene J, Petkeviciene J, Petrauskiene A. The trends in prevalence, awareness and control of hypertension among Lithuanian rural population 1987-2007. XXII Nordic-Baltic Congress of Cardiology, Reykjavik, Iceland, June 3-5, 2009. Cardiology. 2009; 113 (suppl1): 57.
9. Grabauskas VJ, Klumbienė J, Petkevičienė J, et al. Risk factors for noncommunicable diseases in Lithuanian rural population: CINDI survey 2007. Medicina. 2008; 44: 633-639.
10. Conroy RM, Pyörälä K, Fitzgerald AP, et al. Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. Eur Heart J. 2003; 24: 987-1003.
11. Laucevicius A, Kasiulevicius V, Jatuzis D, et al. Lithuanian High Cardiovascular Risk (LitHiR) primary prevention programme - rationale and design. Seminars in Cardiovascular Medicine. 2012; 18: 3.

12. Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III). JAMA. 2001; 285: 2486-2497.
13. Guallar E, Banegas JR, Blasco-Colmenares E, et al. Excess risk attributable to traditional cardiovascular risk factors in clinical practice settings across Europe - The EURIKA Study. BMC Public Health. 2011; 11: 704.
14. Kotseva K, Wood D, De Backer G, et al. EUROASPIRE III. Management of cardiovascular risk factors in asymptomatic high-risk patients in general practice: cross-sectional survey in 12 European countries. Eur J Cardiovasc Prev Rehabil. 2010; 17: 530-540.
15. Lloyd-Jones D, Adams RJ, Brown TM, et al. Executive summary: heart disease and stroke statistics—2010 update: a report from the American Heart Association. Circulation. 2010; 121: 948-954.
16. Grassi G, Cifkova R, Laurent S, et al. Blood pressure control and cardiovascular risk profile in hypertensive patients from central and eastern European countries: results of the BP-CARE study. Eur Heart J. 2011; 32: 218-225.
17. Domarkienė S, Tamošiūnas A, Rėklaitienė R, et al. Trends in main cardiovascular risk factors among middle-aged Kaunas population between 1983 and 2002. Medicina. 2003; 39: 1193-1199.
18. Kearney PM, Whelton M, Reynolds K, Whelton PK, He J. Worldwide prevalence of hypertension: a systematic review. J. Hypertens. 2004; 22: 11-19.
19. Banegas JR, Lɔpez-García E, Dallongeville J, et al. Achievement of treatment goals for primary prevention of cardiovascular disease in clinical practice across Europe: the EURIKA study. Eur Heart J. 2011; 32: 2143-2152.
20. Hajjar I, Kotchen JM, Kotchen TA. Hypertension: trends in prevalence, incidence, and control. Annu Rev Public Health. 2006; 27: 465-490.
21. Grundy SM, Cleeman JI, Merz CN, et al. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. J Am Coll Cardiol. 2004; 44: 720-732.
22. Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics—2012 update: a report from the American Heart Association. Circulation. 2012; 125: e2-e220.
23. Goff DC Jr, Bertoni AG, Kramer H, et al. Dyslipidemia prevalence, treatment, and control in the Multi-Ethnic Study of Atherosclerosis (MESA): gender, ethnicity, and coronary artery calcium. Circulation. 2006; 113: 647-656.
24. O'Meara JG, Kardia SL, Armon JJ, Brown CA, Boerwinkle E, Turner ST. Ethnic and sex differences in the prevalence, treatment, and control of dyslipidemia among hypertensive adults in the GENOA study. Arch Intern Med. 2004; 164: 1313-1318.
25. Sarwar N, Danesh J, Eiriksdottir G, et al. Triglycerides and the risk of coronary heart disease: 10,158 incident cases among 262,525 participants in 29 Western prospective studies. Circulation. 2007; 115: 450-458.
26. Carroll MD, Lacher DA, Sorlie PD, et al. Trends in serum lipids and lipoproteins of adults, 1960-2002. JAMA. 2005; 294: 1773-1781.
27. Miller M, Stone NJ, Ballantyne C, et al. Triglycerides and cardiovascular disease: a scientific statement from the American Heart Association. Circulation. 2011; 123: 2292-2333.
28. World Health Organization. Obesity and overweight facts. Available from: http://www.who.int/hpr/NPH/docs/gs_obesity.pdf [accessed April 2005].
29. Lakka HM, Laaksonen DE, Lakka TA, et al. The metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. JAMA. 2002; 288: 2709-2716.
30. Isomaa B, Almgren P, Tuomi T, et al. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes Care. 2001; 24: 683-689.
31. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. JAMA. 2002; 287: 356-359.
32. Athyros VG, Bouloukos I, Pehlivanidis AN, et al. The prevalence of the metabolic syndrome in Greece: The MetS-Greece Multicentre Study. Diabetes Obes Metab. 2005; 7: 397-405.
33. Hu G, Lindström J, Jousilahti P, et al. The increasing prevalence of metabolic syndrome among Finnish men and women over a decade. J Clin Endocrinol Metab. 2008; 93: 832-836.
34. Buivydaitė K. Changes in risk for coronary heart disease in Kaunas middle-aged population within the latter 20 years. PhD theses, Kaunas, 2004
35. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 2004; 27: 1047-1053.
36. World Health Organization. Definition and diagnosis of diabetes 2006. http://www.who.int/diabetes/publications/Definitionanddiagnosisofdiabetes_new.pdf
37. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004; 364: 937-952.
38. Tacoy G, Balcioglu AS, Akinci S, et al. Traditional risk factors are predictive on segmental localization of coronary artery disease. Angiology. 2008; 59: 402-407.