Morbidity and mortality from the major cardiovascular diseases in Kaunas population from 1983 to 2002

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Key words: ischemic heart disease, stroke, morbidity, mortality, trends.

Summary. The aim of the present study was to evaluate the trends in morbidity and mortality from ischemic heart disease and stroke in Kaunas population aged 25–64 years from 1983 to 2002.

Material and methods. The source of data is the official mortality statistics and Kaunas population-based ischemic heart disease and stroke registers. The methods used for the data collection were those applied by the WHO MONICA project. The object – all permanent residents of Kaunas aged 25–64 years who died from ischemic heart disease and stroke in 1983–2002 and experienced ischemic heart disease or stroke in 1983–2000. The age-standardized rates were calculated by the direct method and using the Segi’s World and European population as a standard. Trends were analyzed using the method of linear regression on logarithms of the age-standardized annual rates.

Results. During 1983 to 2000, the morbidity from acute myocardial infarction among Kaunas men aged 25–64 years decreased by 0.8%/yr. (p=0.08), and during 1986–2000, the morbidity from stroke among men of the same age was without significant changes (−0.4%/yr., p=0.5). Among women, both the morbidity from acute myocardial infarction (1.6%/yr., p=0.006) and the morbidity from stroke (2.9%/yr., p=0.000002) rates among women increased statistically significantly. During 1983 to 2002, the mortality rates from acute myocardial infarction and stroke decreased statistically significantly among both men and women: among men – by 2.2%/yr., p=0.003, and by 2.9%/yr., p=0.004, respectively; among women – by 2.6%/yr., p=0.005, and by 3.2%/yr., p=0.002, respectively.

Conclusions. The morbidity of acute myocardial infarction and stroke remained without significant changes among Kaunas men aged 25–64 years, while it increased statistically significantly among women of the same age during the last two decades. Among both men and women the mortality rates from both ischemic heart disease and stroke decreased significantly from 1983 to 2002.

Introduction
Ischemic heart disease and stroke are the major cardiovascular diseases causing the death of middle-aged population in Lithuania (1). Moreover, these diseases are one of the main reasons of the employable people disablement. In Lithuania, as in other Eastern European countries the morbidity of acute myocardial infarction (AMI) and stroke was increasing in the latter decades (2-4). The significant decrease in the morbidity of AMI and stroke or the mortality from ischemic heart disease (IHD) and stroke was found in Finland, Sweden, France, and USA (5, 6). Besides, comparing the morbidity rates of AMI and stroke between Eastern, Western and Southern European countries, the higher rates were established in the first ones (7-10). During the last decade in some countries such Poland, Czech Republic, Hungary, the decreasing trends in mortality from the main cardiovascular diseases are being observed (11).

The aims of the present study were: 1) to estimate trends in the morbidity rates of AMI and stroke in Kaunas population aged 25-64 years during 1983-2000, according to the ischemic heart disease (IHD) and stroke registers data; 2) to evaluate the mortality rates from IHD and stroke during 1983-2002, according to the official mortality statistics.

Material and methods
Both Kaunas community-based ischemic heart disease register, which is underway since 1983, and

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the community-based stroke register, which is underway since 1986, were used as the primary sources of data. Both registers cover a population of about 220,000 people aged 25-64 years. The methods used for the data collection were those applied by the WHO for the international MONICA (Monitoring of Trends and Determinants in Cardiovascular Diseases) project (12) and were described in detail elsewhere (3). All permanent residents of Kaunas aged 25-64 years who experienced IHD or stroke in 1983-2000 have been considered in the present study. The diagnosis of AMI and stroke was based on the criteria proposed by the WHO MONICA project (12). The epidemiological diagnostic category of AMI or coronary death was defined referring to four diagnostic criteria: 1) symptoms of a coronary event, 2) dynamic changes of ECG indicating the development of AMI, 3) changes of cardiospecific enzymes activity in blood serum and 4) necropsy findings (12). Non-fatal cases were considered in the present study only in case they were assigned to the epidemiological diagnostic categories (EDC): "definite" AMI or "possible" AMI. Fatal cases included those in the EDC: "definite" AMI, "possible coronary death" and "insufficient data". According to the definition of the Stroke study of the WHO MONICA Project, the diagnosis of stroke is based on "sudden onset of clinical signs of focal or global disturbance of cerebral function lasting more than 24 hours (except in cases of sudden death or if the development of symptoms is interrupted by a surgical intervention) with no apparent cause other than a vascular origin" (12). Every AMI or stroke event must have its apparent onset within the study period and more than 28 days from any previously recorded AMI or stroke event in the individual. AMI or stroke attacks occurring within 28 days from the onset of the symptoms of the first attack are considered as one event. After 28 days, new events in the same subject are registered as different attacks and classified as recurrent AMI or stroke events. The AMI or stroke event was defined fatal if the death occurred within the first 28 days from the onset of AMI or stroke. If the patient was alive after 28 days from the onset of the attack, the case was classified as non-fatal. The term "morbidity of AMI and stroke" involve all fatal and non-fatal the first and recurrent events within the first 28 days.

The official mortality statistics data for 1983-2002, obtained from Kaunas Civil Registration Bureau, were used for the mortality analysis. All the death certificates (statistical form No. 106/a) that are filled in and coded by the physician certifying the death were checked for Kaunas permanent population. During 1983-1996, the International Classification of Diseases, 9th revision (ICD-9), and during 1997-2002, the 10th revision (ICD-10) were used. In the present study, deaths from cardiovascular diseases (CVD) - ischemic heart disease and stroke were analyzed. All the morbidity and mortality rates were calculated per 100,000 population per year and were age-standardized using the direct method and the Segi's World (the morbidity rates) and European population (the mortality rates) as a standard (13). The trends in morbidity and mortality rates were analyzed during the two time periods: morbidity trends during 1983-1991 and 1992-2000, and mortality trends during 1983-1992 and 1993-2002. Trends were analyzed using the method of linear regression on logarithms of the age-standardized annual morbidity and mortality rates, using statistical analysis package MS Office Excel. The regression coefficient multiplied by 100 is given as an average yearly change.

**Results**

According to the data of IHD and stroke registers, among Kaunas men aged 25-64 years the average morbidity rate of AMI was 415.7/100,000 in 1983-2000 and the average morbidity rate of stroke was 221.7/100,000 in 1986-2000. Among men, the AMI morbidity rates were about 2-fold higher compared to stroke morbidity rates. The trends in morbidity rates of AMI and stroke among the middle-aged men are shown in Figure 1. According to the results of regression analysis, among men the morbidity rates of AMI were decreasing by 0.8%/yr. (p=0.08) during the study period (1983-2000). During 1986-2000, men's stroke morbidity rates remained without significant changes. Analysis of the data during the two time periods revealed that during 1983-1991 the morbidity rates of both AMI and stroke did not change significantly among men. During 1992-2000, the AMI morbidity rates were decreasing significantly, while the declining trend in corresponding stroke rates did not reach a statistical significance (3.5%/yr., p=0.02, and 2.1%/yr., p=0.2, respectively) (Figure 1).

Among women, the AMI morbidity rates were about 5-fold lower compared to those among men and comprised 85.3/100,000 on average during the study period (1983-2000). During 1986-2000, the average women's morbidity rate of stroke was 126.9/100,000, just 1.7 times lower than corresponding men's rate. The rate ratio in the morbidity of AMI and the morbidity of stroke among women was 0.7. Both the morbidity rates of AMI (1.6%/yr., p=0.006) during 1983-2000, and the morbidity rates of stroke (2.9%/yr.,
During 1983-2002, the morbidity of AMI among Kaunas men aged 25-64 years tended to decrease and the morbidity of AMI among women - statistically significantly increased. The rates in morbidity of AMI among men were on average 5 times higher than among women during the study period. In general, the

**Discussion**

During 1983-2002, the morbidity of AMI among Kaunas men aged 25-64 years tended to decrease and the morbidity of AMI among women - statistically significantly increased. The rates in morbidity of AMI among men were on average 5 times higher than among women during the study period. In general, the
rates in morbidity of AMI, especially among men, were rather high and were similar to same rates of countries such Estonia, Latvia, Poland, Russia and some other neighbor states (11, 14). Although during the last years the AMI morbidity rates started to decrease, they are still about 2 times higher compared with the same rates in the Western and Southern European countries (8, 15), but are similar to the rates reported for the Central and Eastern European countries (16, 17).

During the last years, mortality rates from IHD were decreasing statistically significantly between the both middle-aged Kaunas men and women. The trends in mortality from IHD observed in Kaunas population were similar to those reported for the rural population of the Lithuanian Republic (18). Also rates in morbidity from IHD in Kaunas were similar to the average rates for a Republic (19). During the last 10 years, the mortality from IHD decreased also in other Central and Eastern European countries (11, 20, 21). The data of epidemiological studies showed, that decrease in the prevalence of conventional IHD risk factors contributed a lot to the decrease in morbidity of and mortality from IHD (14, 22, 23). According to the data reported by V. Grabauskas et al, the prevalence of hypercholesterolemia and overweight decreased in Lithuanian rural population in both genders and arterial hypertension - among women. On the other hand, Lithuanian women started to smoke much more (18). The body weight and the level of serum cholesterol are in close relation with the nutrition habits of the population. According to the data of the study of the lifestyle risk factors in Lithuanian adult population, that is carried out since 1994 the nutrition habits of Lithuanian population is changing. The consumption of animal fat (lard, butter, and whole milk) has decreased and the usage of vegetable oil, margarine, dark bread, fresh vegetables and the fruits has increased (24). Recent data of the risk factors survey performed in Kaunas during 2001-2002 showed that the prevalence of arterial hypertension among both middle-aged men and women significantly decreased, the prevalence of hypercholesterolemia remained stable, and the prevalence of smoking among women increased (25, 26). The changes in the morbidity rates of and the mortality rates from IHD are being related not only with the decrease in the prevalence of the main IHD risk factors, but also with changes in social-economical factors, in education level, with changes in habits of alcohol drinking, with newest diagnostic and treatment possibilities (27, 28).
According to the data of some researches, decreasing mortality rates from IHD are determined by the use of the newest treatment tactics and technologies, by the appearance of more effective drugs in the market, and by more frequent use of the interventional procedures, such as angioplasty, thrombolysis, coronary artery bypass and others (15, 29). Decreasing mortality rates from IHD during the last ten years as it was found in the present study, could be determined by the increased usage of the certain medications, such as angiotensin converting enzymes inhibitors, beta-blockers, antiagregants, and by the increase in number of coronarography and angioplastic procedures among patients with AMI (30).

Although the mortality rates from stroke are decreasing in many Western European countries, to date just Finland and the Netherlands report decreasing trends in the morbidity of stroke (6). The data from other regions of the world are rather variants. For example, the prospective Honolulu Heart Survey reported the decreasing trends in the morbidity rates of stroke among Japanese origin Hawaii’s men that were followed-up from 1969-1988 (31). Several studies from Japan, also showed, that the morbidity rates of stroke are decreasing (32). On the other hand, stable or even increasing trends in the morbidity of stroke were reported by the Framingham study (33), by the studies from Canada (34), New Zealand (35), and from the Minnesota Heart Study (36).

The increase in the morbidity rates of stroke in Rochester (USA) that was observed in the beginning of nineteenth of the 20th century, most often has been explained by the appearance of the computed tomography (CT) scan (37). Our data also show, that the use of CT scan increased in stroke patients during the last years and reached 36% in 1997 (unpublished data). Nevertheless, CT scan was equally used among both men and women. In addition, as it was pointed out in the methods section in the present study diagnosis of stroke is based on typical neurological symptoms but not the findings of the diagnostic procedures. Thus, the increase in the proportion of the CT scan performed can’t explain the increasing trend in the morbidity rates of stroke among women. It looks like, that the increase in the women’s morbidity rates of stroke is real. It is worth to note that this is not an exceptional fact; since one recent Swedish study also demonstrated that the morbidity of stroke is increasing only among women while remaining rather stable among men (38). Diverging trends in the morbidity of stroke among men and women were reported and by several other authors (39, 40).

During the last two decades (1983-2002), the mortality from stroke statistically significantly decreased among Kaunas middle-aged population, and the rates of mortality from stroke compared with other Western European countries can be considered as rather modest (41). The authors of the South Alabama Study hypothesized, that relatively low mortality from stroke can be attributable to the increased use of the newest and more effective methods of conservative and surgical treatment (42). This may be associated and with some other reasons: first, improve in treatment of stroke treatment in the acute phase and in secondary prevention of stroke, second, less severe forms of stroke.

According to the data of Kaunas MONICA study, during 1983-1993, no changes in the prevalence of the main stroke risk factors were registered, except the significant decrease in body mass index and the prevalence of obesity among both middle-aged Kaunas men and women. Also the increasing tendency in the proportion of the effectively treated arterial hypertension among hypertensive patients was noted (43). According to the results of the recent risk factors screening that took place in Kaunas in 2001-2002, over 10 years, the prevalence of arterial hypertension significantly decreased both among men and women while the prevalence of smoking significantly increased among women (25, 26). Arterial hypertension and smoking are not the only risk factors for stroke. We do not have data on the prevalence and changes of many other possible risk factors of stroke, such as psycho-emotional stress, level of serum fibrinogen, homocysteine and other biochemical markers (44), which also may be influenced by a number of environmental factors.

It might be concluded that the reasons of decline or increase in the morbidity of and the mortality from IHD and stroke are not fully elucidated yet. Therefore, the new studies, designed to look for and to elucidate the true role of various social-economics conditions, behavioral and environmental factors on the changes of the rates are urgently needed. There is a lack of data on the prevalence of such risk factors of stroke, as heart failure and atrial fibrillation among Lithuanian. Future investigating trends it all goes to show the directions in the epidemiology of IHD and stroke.

Conclusions
1. The morbidity rates of AMI and stroke were without significant changes among Kaunas men aged 25-64 years and significantly increased among women of the same age during the last two decades.
2. The mortality rates from IHD and stroke significantly decreased both among Kaunas men and women during 1983 to 2002.
Kauno gyventojų sergumumas ir mirtingumas nuo pagrindinių širdies ir kraujagyslių ligų 1983–2002 m.

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Raktas:

Širdies ligos, galvos smegenų insultas, sergumumas, mirtingumas, pokyčiai.

Santrauka.


Rezultatai. Analizuojamojo laikotarpio (1983–2000) vyrų sergumumas ūmio miokardo infarktui mažėjo vidutiniškai 0,8 proc./m. (p=0,08). Per 1986–2000 metus vyrų sergumumas galvos smegenų insultu reikšmingai mažėjo (-0,4 proc./m., p=0,5). Moterų sergumumo ūmio miokardo insultu (1,6 proc./m., p=0,006) ir sergumumo galvos smegenų insultu rodikliai (2,9 proc./m., p=0,000002) reikšmingai didėjo. Kauno miesto oficialiosios mirtingumo statistikos duomenimis, 1986–2002 m. vyrų ir moterų mirtingumas tiki nuo širdies ligos, tiek nuo galvos smegenų insulto statistiškai reikšmingai mažėjo: vyrų – atitinkamai 2,2 proc./m., p=0,003 ir 2,9 proc./m., p=0,004; moterų – atitinkamai 2,6 proc./m., p=0,005 ir 3,2 proc./m., p=0,002.

Išvados. Kauno 25–64 metų vyrų sergumumas ūmio miokardo infarktui ir galvos smegenų insultu per pastarusius du dešimtmečius reikšmingai mažėjo, o moterų – reikšmingai didėjo. Tiek vyrų, tiek moterų mirtingumo nuo širdies ligos ir galvos smegenų insulto rodikliai analizuojamojo laikotarpio reikšmingai mažėjo.