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Sudden death due to ischemic heart disease among adolescents and young adults before and after the socio-economic changes in 1989 of Hungary

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Background: Ischemic heart disease (IDH) mortality is generally accepted as an indicator of socio-economic conditions. In view of the health status of future generations, sudden cardiac deaths among adolescents and young adults are a considerable focus of attention of public health specialists. In a changing social environment, the rate of sudden deaths in youths could be a sensitive indicator in the evaluation of health effects. Coronary artery anomalies, myocarditis and cardiomyopathies are the most common causes of sudden cardiac deaths in adolescents, and young adults. The aim of this study was to detect the changes in the rate of ischemic heart disease mortality among young people before and after the socio-economic change of 1989 in Hungary.
Material and method: Data on ischemic mortality were collected from the years 1979-2000. Death certificates were obtained from the Office for National Statistics.
Results: There was a significant reduction in coronary mortality in young male adults in the age group of 20-24 years (OR=1.69, CI=1.23-2.32, p=0.00082), 25-29 years (OR=1.3, CI=1.11-1.53, p=0.00094) and 30-34 years (OR=1.37, CI=1.25-1.51, p=0.0000001) after the socio-economic change of 1989. Among young females, the mortality showed a reduction only in the age group of 20-24 years (OR=1.69, CI=1.18-2.45, p=0.039).
Discussion: Mortality rates of ischemic heart disease in adolescents and young adults may reflect the changes of socio-economic conditions. Early detection and treatment of youths at risk of premature IHD offers the greatest promise and an opportunity for gender-specific interventions.

Key words: Ischemic heart disease, social-economic changes, sudden death, youth

BACKGROUND

Ischemic heart disease (IHD) mortality is generally accepted as an indicator of socio-economic conditions [1, 2]. There are several classic and newly discovered risk factors of IHD [3-5]. The available health care system [6], the quality of food [7], living and working conditions [8, 9], types of recreational or sport activities [10, 11], health behavior [12] and immunization status [13] may influence the rate of these premature deaths. At the end of the 1980s, people in Eastern European countries faced changes of social-economic conditions and medico-legal environment [14]. The rate of IHD mortality among adolescents and young adults is generally low [15, 16] comparing to other leading death causes in these age groups, such as accidents, suicide and other natural causes. However, any small change of this incidence might be a sensitive indicator reflecting socio-economic differences [17]. Characteristic patterns of IHD mortality at young age can be identified after socio-economic changes. The medico-legal investigation and early detection of risk factors may help in the evaluation of effective preventive strategies.

Our aim in this study was to identify any significant reduction in the incidence of IHD mortality among adolescents and young adults that might be detected after the social-economic changes introduced in 1989 in Hungary.

MATERIALS AND METHODS

Data sources

Copies of death certificates related to all deaths of individuals aged 15-34 years and being residents of Hungary in 1979-2000 were obtained from the Office for National Statistics. The forensic autopsy rate of sudden deaths at young ages is very high in Hungary. All IHD death cases were examined by forensic pathologists or hospital pathologists. The data included deaths in each year, using the 9th and 10th revisions of the International Classification of Diseases (ICD). The 9th version was used in Hungary between 1978 and 1994 (IHD with a 3-digit code), and the 10th version with detailed codes was introduced in 1995 (IHD code I20-I25).

Comparison of cases

IHD mortality rates in adolescents and young adults in four different age groups (15-19, 20-24, 25-29, and 30-34 years) were investigated. The incidence of IHD deaths in youths was compared in periods before and after the introduction of socio-economic changes in 1989. Age-standardized mortality rates by sex were calculated for the age groups.

Statistical method

The Chi-square test with Yates correction factor was used to compare the numbers of total death cases and IHD mortality for the two periods.

Ethical approval

Ethical approval for the project was granted by the Hungarian Ethic Committee (No: 42/2005).

RESULTS

Common causes of death of Hungarian adolescents and young adults

Table I summarizes the proportion of deaths (1979-2000) attributed to the following groups of ischemic and other natural or violent death causes. The most common causes of death were road traffic accidents, and other violence causes. There was a decrease in the total number of deaths in individuals below 34 years of age after the year 1989. In the period 1979-1989, IHD mortality accounted for an

Table I. Distribution of death causes among Hungarian adolescents and young adults (15-34 years).

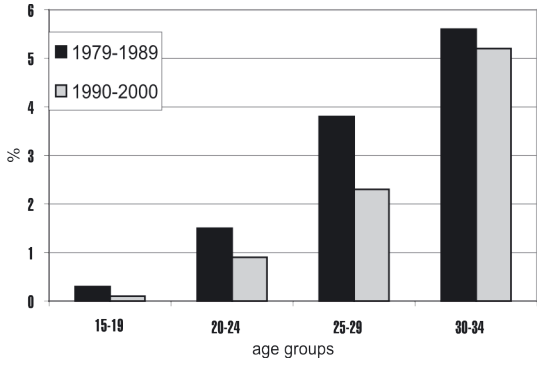
year	Ischaemic No (%)	Cardiovascular No (%)	Tumour No (%)	Other natural No (%)	Violence No (%)	all
1979	172 (4,8)	480 (13,4)	475 (13,2)	509 (14,2)	1950 (54,4)	3586
1980	185 (5,1)	518 (14,2)	490 (13,4)	499 (13,7)	1952 (53,6)	3644
1981	245 (6,2)	615 (15,5)	502 (12,7)	549 (13,8)	2057 (51,8)	3968
1982	263 (7,2)	585 (15,9)	480 (13,1)	420 (11,4)	1928 (52,4)	3676
1983	239 (6,0)	576 (14,5)	502 (12,6)	652 (16,5)	2004 (50,4)	3973
1984	247 (6,2)	620 (15,6)	505 (12,7)	598 (14,9)	2016 (50,6)	3986
1985	224 (5,6)	521 (13,0)	495 (12,4)	623 (15,5)	2143 (53,5)	4006
1986	218 (5,6)	542 (13,9)	462 (11,9)	647 (16,6)	2024 (52,0)	3893
1987	225 (6,0)	516 (13,7)	464 (12,3)	559 (14,7)	2011 (53,3)	3775
1988	216 (6,0)	492 (13,7)	452 (12,6)	521 (14,6)	1905 (53,1)	3586
1989	196 (5,1)	469 (12,3)	464 (12,2)	675 (17,8)	2002 (52,6)	3806
1990	196 (5,1)	496 (12,9)	443 (11,6)	657 (17,1)	2042 (53,3)	3834
1991	167 (4,7)	455 (12,8)	424 (11,9)	608 (17,1)	1906 (53,5)	3560
1992	171 (4,7)	457 (12,6)	386 (10,6)	635 (17,6)	1979 (54,5)	3628
1993	152 (4,6)	398 (12,1)	394 (11,9)	720 (21,8)	1638 (49,6)	3302
1994	118 (3,7)	352 (11,3)	341 (10,9)	709 (22,7)	1605 (51,4)	3125
1995	142 (4,8)	325 (11,0)	329 (11,1)	654 (22,0)	1513 (51,1)	2963
1996	96 (3,7)	295 (11,5)	344 (13,4)	519 (20,2)	1315 (51,2)	2569
1997	77 (3,1)	278 (11,1)	311 (12,4)	507 (20,9)	1339 (52,5)	2512
1998	75 (2,9)	260 (10,2)	337 (13,2)	473 (18,6)	1404 (55,1)	2549
1999	82 (3,4)	267 (11,0)	304 (12,6)	472 (19,5)	1296 (53,5)	2421
2000	91 (3,8)	267 (11,3)	299 (12,7)	415 (17,6)	1291 (54,6)	2363

Table II. Rate of ischemic mortality in the investigated periods.

age group	period 1 (1979-1989)		period 2 (1990-2000)	
	male ischemic death/ all male death	female ischemic death/ all female death	male ischemic death/ all male death	female ischemic death/ all female death
15-19	15/3848	5/1511	14/3291	2/1377
20-24	121/5598	28/1892	65/5035	15/1753
25-29	466/8167	115/3053	262/5901	44/5001
30-34	1376/12606	295/5287	821/10027	191/3646

average of 3.5% (range 2.8-4%) of all death cases. In the period 1990-2000, IDH mortality decreased significantly to an average of 1% (range 0.4-1.5%) of all deaths. IHD mortality increased by age, but the rate was decreasing during the second decade in every age group. The data demonstrated male predominance; however, IHD mortality showed a significant decrease among male victims in the investigated periods. In contrast, the reduction of IHD mortality in females did not follow the same patterns.

Figure 1. Reduction of IHD mortality in periods 1979-1989, and 1990-2000.
A – Male
B – Female



Reduction of IHD mortality following the introduction of socio-economic changes in 1989

IHD mortality was investigated (Table II) in comparison with all death cases at the age of 15-34 years (periods examined: period 1, 1979-1989; period 2, 1990-2000). The highest percentage of deaths during both periods occurred in the age group of 30-34 years: period 1 (9.3%); period 2 (7.4%). The proportion of deaths showed a decrease in the age group of 25-29 years: period 1 (5.2%); period 2 (3.9%), in the age group of 20-24 years: period 1 (2%); period 2 (1.2%), and in the age group of 15-19 years: period 1 (0.4%); period 2 (0.3%). In both periods, these figures were below 5% for the age groups of 20-24 and 15-19 years.

The proportion of IHD deaths in relation to total mortality decreased slightly in period 2 (105/1580, 6.7%) compared with period 1 (297/5849, 5.1%). In males, the greatest decrease was detected in the age group of 30-34 years: period 1, 1376/12606 (10.9%); period 2, 821/10027 (8.2%). In the other age groups, the proportion of deaths showed a lower decrease between period 1 and period 2. The data on female IHD deaths did not show such a rapid reduction, however, a decrease was detected in the age group of 30-34 years: period 1, 295/5287 (5.6%); period 2, 191/3646 (5.2%).

The pattern of total mortality did not alter significantly between the two periods. In period 1, before the introduction of the socio-economic changes, the proportion of deaths among individuals aged 15-34 years was 3632/5849 (62%) compared with period 2 995/1580 (63%). The proportions of IHD deaths among adolescents and young adults were 143/297 (48%) in period 1, but fell to 41/105 (39%) in period 2. The greatest decrease was observed at the age of 30-34 years (4.9%).

In period 1, there were 271 (91%) IHD deaths of individuals older than 29 years as compared to period 2 with 87 (82%) cases. In male IHD mortality, there was a significant difference between the investigated periods: age group of 20-24 years (OR=1.69, CI=1.23-2.32, p=0.00082), age group of 25-29 years (OR=1.3, CI=1.11-1.53, p=0.00094), and age group of 30-34 years (OR=1.37, CI=1.25-1.51, p=0.00000001). Among females, only in the age group of 20-24 years (OR=1.69, CI=1.18-2.45, p=0.039) was a remarkable reduction in IHD mortality detected.

DISCUSSION

This paper examines IDH mortality among adolescents and young adults before and after the introduction of socio-economic changes in Hungary. The proportion of IDH mortality in younger groups decreased from 48% in the period 1979-1989 to 39% in the period 1990-2000. As in the previous studies in Germany and Poland [6], the greatest decrease in deaths was noted among male vic-

tims. The incidence of IHD deaths may reflect the changes of socio-economic conditions and quality of medical treatment. Psychosocial effects [18, 8], community-level characteristics [14] and biomedical parameters [5] should be examined as risk factors for IDH mortality in youths.

Until recently, coding of cause of death in Hungary was performed by death-certifying doctors, whereas in Western Europe this was done by trained persons at the statistical office. However, this fact was not expected to affect our results in the two investigated periods. As a consequence, the distribution of diagnostic groups within the ICD category of IHD was defined by similarly trained physicians in the period 1979-1994 with the 9th ICD version (code 414-414), and in the period 1995-2000 with the 10th ICD version (code I20-I25).

Trends in mortality in youths have shifted over the past decades from predominantly infectious to having social etiologies [20]. In adolescents and young adults, 30% of sudden natural deaths were reported as cardiac deaths [21]. Cardiac causes of sudden deaths are generally related to myocarditis, cardiomyopathies [22], coronary, valvular, or myocardial disease [16]. In Hungary, 47.4% of all death cases were natural in the investigated age groups. The data show a high percentage (52.6%) of violent causes in mortality rates in adolescents and young adults. Our results agree with mortality trends showing a decline in Eastern and Western European countries between the mid-1970s and mid-1980s [14]. In this period, a slight decline was observed in IHD mortality in adolescents and young adults in Hungary, IHD mortality should not generally be interpreted as the consequence of quality of medical care. Our data suggest that by the 1990s, IHD mortality changed considerably in Hungary. This phenomenon has also been noted in other countries, such as the Baltic Republics [23], Russia [19] and Germany [24].

Our results correspond to data derived from another study [16], the authors of which stated that IDH mortality is 2-3 times lower among young females as compared to males, and men generally develop IHD earlier than women [17]. Gender differences in traditional risk factors, such as smoking, obesity, hypertension, high plasma total and low high-density lipoprotein cholesterol explain only 40% of the variation in the gender ratios of IHD mortality [25]. Males reported more signs of psychosocial stress and social isolation, less effective coping mechanisms and lower self-esteem, and more vital exhaustion [18]. Lifestyle factors, which are positively or negatively correlated with cardiovascular diseases, show a gender-specific prevalence;; more women reported healthy nutrition and more men reported partaking in physical exercise [9]. IHD is the leading cause of death in women in most industrialized countries [8]. A relatively stronger association has been detected between work stress and coronary heart disease among men [26]. Brezinka and Kittel [8] reported that psychosocial adjustment in women after a myocardial infarction was poorer than in men, and return to work rates after a myocardial infarction or coronary bypass grafting were significantly lower in women than in men. Work content, workload and control, reactions to physical and emotional stress, and burnout showed that sensitivity was higher in women than in men [18].

Our data suggest that changes in socio-economic transition contributed to changes in IHD mortality, particularly in young men in the age groups of 20-24, 25-29, and 30-34 years. IHD mortality among women showed a decrease only in one age group of 24-29 years. Although men reported lower availability of social support from fewer sources than women [25], our results suggest that the decrease of IHD mortality after the socio-economic change in Hungary was much lower in women, than in men. Our data have demonstrated that the young male population enjoys the advantages of the slowly increasing number of social, economic and medical treatment facilities at a higher rate than the young female population.

Public health agencies take responsibility for promoting healthier practices, such as a decrease of smoking, more physical activity and greater consumption of fruit and vegetables [5, 7, 13]. Our findings imply that efforts to promote health should be concentrated both on the promotion of healthier lifestyles, and on improvement of health care conditions. Behavioral interventions designed to increase social support, decrease depression rates and improve lifestyle behaviors and coping skills appear to be more promising venues for prevention, rather than interventions aiming at reducing traditional coronary risk factors [17]. Gender-specific interventions may be required to yield effective outcomes to protect female adolescents and young adults from IHD mortality. Early detection and treatment of youths at risk of premature IHD offers the greatest promise of decreasing IHD mortality.

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