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*Full Length Research Paper*

# Long-term trends and determinants of myocardial infarction morbidity, mortality, and lethality in Russian population

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**The objective of the study was to elucidate 33-year trends and determinants in myocardial infarction (MI) morbidity, mortality, and lethality in Russia in 1977 to 2009. Data of WHO studies (Acute Myocardial Infarction Register and MONICA) were analyzed in three districts of Novosibirsk. MI morbidity in 25 to 64-year-old population in Russia was found to be one of the highest in the world. MI morbidity rates remained steady for the entire period of study except for 1988, 1994, 1998 (increase), 2002 to 2004, and 2006 (decrease). Changes in mortality and lethality were similar to changes in morbidity except for 1977 to 1978 and 2002 to 2005. Prehospital mortality and lethality rates significantly exceeded the rates of in-hospital deaths. MI mortality rates exceeded death rates caused by alcohol abuse by 2 to 3 times. Mortality and lethality decrease during period of unchanged morbidity suggested improvement in cardiac care; increase in mortality and lethality at a time of decreased morbidity indicated disorganization of medical services. Prevalence of psychosocial risk factors significantly increased over time, whereas levels of behavioral and somatic risk factors remained unchanged. MI morbidity, mortality, and lethality rates were markers of increasing social stress in population. MI deaths were the main component of increase in mortality in Russia.**

**Key words:** Myocardial infarction, epidemiology, morbidity, mortality, risk factors.

## INTRODUCTION

Russia entered the 21st century with an array of problems affecting both human well-being and national security. One of the most severe challenges was the unfavorable demographic situation developed in the 1990s when the so-called “Supermortality” reached five million people, whereas life expectancy at birth dropped to extremely low 59 years. The medical components of the problem were significant and the cardiovascular diseases (CVD) remained the number one cause of increased mortality contributing to 55.4% of all deaths. Among 2,200,000 people deceased in Russia in 2000, 1,200,000 died of CVD. The most alarming observation was the fact that the morbidity and mortality rates escalated among people in their most productive years despite the increased CVD detection (Chazov, 2002; Demographic Data in Russia 1994; Main Indicators of Quality of Life in the Population of the Russian Federation, 1994) Keeping that in mind, accurate and comparable data for characterizing the long-term CVD trends should be obtained based on the standard, strictly unified programs which are in a great demand to provide a background for fighting CVD. Such studies enable us to understand nature of the ongoing changes in population, helping us to find the ways to mend the situation and to evaluate the effect of the preventive

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measures (Politics and Strategy in Prevention of Cardiovascular and other Non-Communicable Diseases in a Context of Health Care System Reforms in Russia, 1997; European Regional Technical Consultation on Noncommunicable Disease, 2012). To our knowledge, no available study in the literature describes identical or similar data obtained by using the World Health Organization (WHO) programs.

The objective of the present study was to analyze the 33-year (from 1977 to 2009) long-term trends and determinants in myocardial infarction (MI) morbidity, mortality, and lethality in a high-risk population of the West Siberian metropolis (the city of Novosibirsk) using the unified approach in a framework of three WHO studies including the Acute Myocardial Infarction Register, Multinational Monitoring of Trends and Determinants in Cardiovascular Disease (MONICA), and MONICA-psychosocial World Health Organization 1970, 1976, 1985).

## MATERIALS AND METHODS

The WHO Acute Myocardial Infarction Register-based study covered the population aged 25 to 64 years in three districts of the city of Novosibirsk including the Oktyabrsky (starting on January 1, 1977), Leninsky, and Kirovsky districts (starting on January 1, 1981). A total population of three districts included 600,000 people. The WHO MONICA project proceeded in the same districts from 1983. No significant differences between data of two programs were found (Gafarov, 1989). Quality assessment of the diagnostic MI categories was done by the WHO Quality Control Centre for Event Registration in Dundee (Scotland) World Health Organization MONICA Project, 1987, 1990, 1992, 1994, 1997). Long-term monitoring program covered 24,835 cases of MI including 8122 lethal outcomes during a period from January 1, 1977 to December 31, 2009. Standardization was performed using the standard world population. Representative random samples (a total of 2981 males aged 25 to 64 years) were examined in the Oktyabrsky district accordingly to three standard screening epidemiology programs: WHO MONICA, MONICA-psychosocial, (1984, 1988, and 1994), and HEPIEE (2000). The response rates were 71.2, 71.3, and 82.1% for the first, second, and third screening studies, respectively.

An anxiety level on a subscale of anxiety as a personality trait was evaluated using the Spielberger's test (Spielberger, 1972). Social support was evaluated with the method developed by Berkman and Syme based on calculation of a social network index (SNI) and an index of close contacts (ICC). Encoding of the test consisted in plotting of the index components and calculating the scores according to the proposed algorithm (MONICA Psychosocial Optional Study, 1988).

All new cases of MI in cohort were registered among people who did not have CVD at the moment of examination according to the WHO Acute Myocardial Infarction Register data covering a period of 20 years (from 1984 to 2004). A total of 280 newly diagnosed MI cases were detected.

Statistical analysis of data was performed using the SPSS 11.5 Software. The stratified Cox proportional regression model was used for determination of the relative risk (RR). A chi-squared test ($\chi^2$ test) was used as the most important member of the nonparametric family of statistical tests.

## RESULTS

Our results suggested that MI morbidity in a high risk population of the city of Novosibirsk in Russia was one of the highest in the world. Table 1 shows 33-year trends in the MI incidence rates. Myocardial infarction morbidity during 33-year study was relatively steady except for the years of 1988, 1994, and 1998 that revealed significant increase in morbidity ($\chi^2 = 5.482$, $\nu = 1$, $p < 0.05$; $\chi^2 = 16.31$, $\nu = 1$, $p < 0.01$; $\chi^2 = 4.876$, $\nu = 1$, $p < 0.05$, respectively). Statistically proven decrease in the MI incidence rates was found during a period from 2000 to 2004 and in 2006 ($\chi^2 = 4.573$, $\chi^2 = 3.529$, $\nu = 1$, $p < 0.05$, respectively), whereas an upward trend of the rates was observed during a period from 2007 to 2009. For the entire period of the study, a significant age-dependent increase in the MI morbidity rates was found in both gender groups. The MI incidence rates in males prevailed over those of females by 2 to 7 times in all age groups ($\chi^2 = 12.976$, $p < 0.01$; $\chi^2 = 19.367$, $\nu = 1$, $p < 0.001$, respectively) (Figure 1). The highest increase in MI morbidity was observed among males (3–5-fold, $\chi^2 = 18.826$, $\nu = 1$, $p < 0.001$) and females (5–10-fold, $\chi^2 = 21.464$, $\nu = 1$, $p < 0.001$) in the 45 to 54-year-old age groups in comparison with the preceding age groups. Analysis of temporal changes in MI morbidity in different age groups showed that increase in the MI incidence rates in 1988 was mostly associated with the group of 45 to 64-year-old males, whereas increases in 1994 and 1998 were due to the MI events among 55 to 64-year-old males and in the groups of 35 to 44, 45 to 54, and 55 to 64-year-old females. Decreases in the MI incidence rates during a period from 2002 to 2004 and in 2006 were found mostly in males, whereas the upward trend in mortality from 2007 to 2009 was caused by the MI events in both gender groups with female predominance (Table 1).

Mortality during the entire 33-year period of study remained steady with the exception of the declined death rates in 1977, 1978 ($\chi^2 = 9.063$, $\nu = 1$, $p < 0.05$), and 2006 ($\chi^2 = 5.142$, $\nu = 1$, $p < 0.05$) and increased mortality in 1988 ($\chi^2 = 11.589$, $\nu = 1$, $p < 0.001$), 1994 ($\chi^2 = 13.573$,

**Table 1.** Acute myocardial infarction (MI) morbidity, mortality, and lethality rates in 1977 to 2009 in Novosibirsk according to the WHO Acute Myocardial Infarction Register and MONICA Programs.

| Year | MI incidence rate per 1,000 | | | MI death rate per 100,000 | | | | | | Lethality (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | m | | | f | | | | | |
| | m | f | m+f | iH | oH | iH+oH | iH | oH | iH+oH | m | f | m+f |
| 1977 | 4.3 | 1.6 | 3.1 | 70.1 | 125.4 | 195.5 | 32.1 | 43.7 | 75.8 | 45.3 | 35.6 | 41.6 |
| 1978 | 4.5 | 1.7 | 3.2 | 25.8 | 118.0 | 143.9 | 20.4 | 40.8 | 61.2 | 31.7 | 28.8 | 30.6 |
| 1979 | 5.2 | 2.0 | 3.3 | 32.2 | 114.5 | 146.7 | 13.9 | 44.4 | 58.3 | 28.1 | 33.9 | 29.8 |
| 1980 | 5.6 | 1.7 | 3.3 | 23.4 | 131.8 | 158.2 | 14.1 | 45.2 | 59.3 | 28.4 | 36.8 | 30.7 |
| 1981 | 5.3 | 1.6 | 3.3 | 39.3 | 119.6 | 158.9 | 3.9 | 27.6 | 31.5 | 29.9 | 18.9 | 26.8 |
| 1982 | 4.6 | 1.7 | 3.0 | 37.6 | 109.5 | 147.1 | 13.1 | 26.5 | 39.6 | 27.5 | 24.8 | 26.7 |
| 1983 | 5.0 | 2.0 | 3.4 | 26.4 | 106.3 | 132.7 | 5.9 | 43.7 | 49.6 | 26.2 | 24.2 | 26.6 |
| 1984 | 4.9 | 1.7 | 3.2 | 36.9 | 133.6 | 170.5 | 15.8 | 35.5 | 51.3 | 32.9 | 28.0 | 31.4 |
| 1985 | 5.7 | 2.1 | 3.8 | 48.1 | 124.5 | 172.6 | 21.1 | 43.9 | 65.0 | 31.5 | 31.8 | 31.8 |
| 1986 | 5.5 | 1.8 | 3.6 | 39.1 | 122.7 | 161.8 | 7.0 | 49.7 | 56.7 | 30.7 | 31.2 | 30.8 |
| 1987 | 6.0 | 1.6 | 3.6 | 59.8 | 116.7 | 176.5 | 5.6 | 42.9 | 48.5 | 29.0 | 31.5 | 29.6 |
| 1988 | 6.1 | 2.0 | 3.9 | 80.3 | 185.6 | 265.9 | 13.8 | 49.8 | 63.6 | 43.1 | 40.7 | 42.5 |
| 1989 | 5.1 | 1.4 | 3.2 | 23.3 | 148.8 | 172.1 | 7.9 | 54.9 | 62.8 | 34.3 | 37.1 | 35.1 |
| 1990 | 5.2 | 1.5 | 3.3 | 39.1 | 139.3 | 178.4 | 16 | 27.7 | 43.7 | 36.6 | 36.3 | 36.5 |
| 1991 | 5.1 | 1.5 | 3.2 | 31.5 | 132.7 | 166.3 | 11.8 | 33.9 | 45.7 | 32.8 | 34.5 | 33.2 |
| 1992 | 5.0 | 1.7 | 3.3 | 34.2 | 147.2 | 181.3 | 20.3 | 33.3 | 53.6 | 35.6 | 31.1 | 34.3 |
| 1993 | 6.4 | 2.0 | 4.1 | 36.1 | 170.2 | 206.4 | 11.3 | 47.4 | 58.7 | 32.1 | 27.5 | 30.8 |
| 1994 | 7.1 | 2.2 | 4.5 | 47.3 | 217 | 264.2 | 15.2 | 66.1 | 81.3 | 38.6 | 36.7 | 38.0 |
| 1995 | 6.0 | 1.8 | 3.7 | 27.0 | 147.2 | 174.1 | 9.6 | 43.5 | 53.1 | 30.3 | 28.8 | 29.9 |
| 1996 | 5.9 | 2.0 | 3.8 | 21.1 | 148 | 169.1 | 7.7 | 46.3 | 54.0 | 29.3 | 25.7 | 28.3 |
| 1997 | 5.8 | 2.0 | 3.8 | 26.1 | 165.4 | 191.5 | 11.0 | 32.0 | 43.0 | 33.0 | 19.8 | 29.1 |
| 1998 | 6.5 | 2.2 | 4.2 | 42.3 | 166.6 | 208.9 | 14.3 | 39.7 | 54.0 | 32.4 | 23.1 | 29.7 |
| 1999 | 6.3 | 1.7 | 3.8 | 29.8 | 165.0 | 194.7 | 6.2 | 40.6 | 46.8 | 30.9 | 26.8 | 29.9 |
| 2000 | 6.6 | 2.0 | 4.1 | 19.8 | 167.5 | 167.5 | 12.5 | 43.7 | 56.2 | 25.5 | 28.6 | 26.3 |
| 2001 | 5.2 | 1.7 | 3.3 | 29.8 | 172.7 | 202.6 | 11.4 | 38.4 | 49.8 | 38.8 | 28.6 | 35.9 |
| 2002 | 5.5 | 1.8 | 3.5 | 29.8 | 190.2 | 220.0 | 12.4 | 48.8 | 61.2 | 40.7 | 33.5 | 38.6 |
| 2003 | 4.9 | 1.8 | 3.2 | 16.2 | 177.7 | 193.9 | 11.4 | 49.8 | 61.2 | 39.5 | 34.3 | 37.9 |
| 2004 | 4.3 | 1.2 | 2.6 | 35.9 | 162.7 | 198.6 | 15.8 | 33.6 | 49.4 | 46.1 | 40.3 | 44.6 |
| 2005 | 5.4 | 1.3 | 3.1 | 27.3 | 218.8 | 247.1 | 9.8 | 38.2 | 48.0 | 32.4 | 45.2 | 44.4 |
| 2006 | 4.5 | 1.4 | 2.8 | 26.1 | 120.0 | 146.1 | 2.9 | 29.4 | 32.3 | 32.4 | 24.1 | 30.1 |
| 2007 | 4.3 | 1.2 | 2.6 | 19.7 | 126.5 | 146.2 | 7.6 | 27.7 | 35.3 | 33.9 | 28.5 | 32.5 |
| 2008 | 4.8 | 1.4 | 2.9 | 14.5 | 125.0 | 139.5 | 10.2 | 19.4 | 29.6 | 29.1 | 21.2 | 27.1 |
| 2009 | 4.7 | 1.8 | 3.1 | 15.6 | 138.4 | 154.0 | 6.5 | 24.9 | 31.4 | 32.8 | 17.4 | 27.9 |

MI, myocardial infarction; m, male; f, female; m+f, male and female; iH, in-hospital; oH, out-of-hospital; iH+oH, in-hospital and out-of-hospital.

$\nu = 1$, $p < 0.001$), 1998 ($\chi^2 = 8.489$, $\nu = 1$, $p < 0.05$), 2002, and 2005 ($\chi^2 = 4.649$, $\chi^2 = 3.837$, $\nu = 1$, $p < 0.05$, respectively) (Figure 2). Reduction in mortality in 1977 and 1978 and increase in death rates in 1994 and 1998 were found in both gender groups. On the other hand, MI mortality significantly increased in 1988, 2002, 2005 and decreased in 2006 only in male groups.

Dynamics of age-dependent mortality resembled that of morbidity. The MI mortality rates were increasing from the younger age groups toward the older ones for both sexes through the entire period of study. The mortality rates in males were 2 to 3 times higher than in females ($\chi^2 = 15.841$, $\nu = 1$, $p < 0.001$). The lethality changes resembled dynamics of mortality. During the first two years of study (1977 and 1978), a significant decrease in MI lethality was found in both gender groups ($\chi^2 = 4.080$, $\nu = 1$, $p < 0.05$). An increase in lethality was found in males in 1998 ($\chi^2 = 5.844$, $\nu = 1$, $p < 0.05$) and in both sexes in 1988 ($\chi^2 = 5.802$, $\nu = 1$, $p < 0.05$), 1994 ($\chi^2 = 6.103$, $\nu = 1$, $p < 0.05$), and from 2001 to 2005 ($\chi^2 = 4.649$, $\chi^2 = 3.837$, $\nu = 1$, $p < 0.05$) (Figure 3). During the entire period of the study, the highest lethality rates

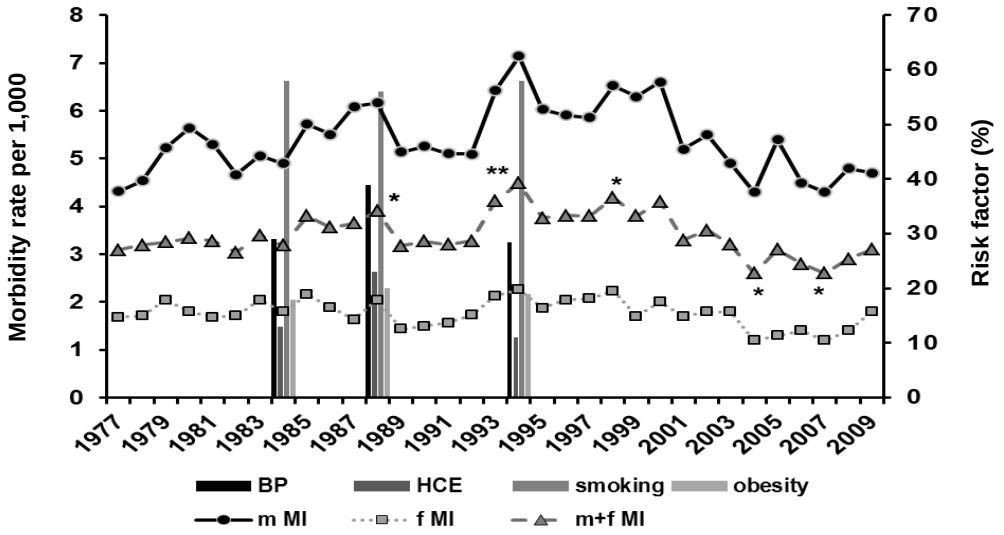


**Figure 1.** Annual acute myocardial infarction (MI) morbidity rates (per 1000 population) among 25 to 64-year-old residents of Novosibirsk and common CVD risk factors in males. *p<0.05; **p<0.01. BP, blood pressure; HCE, hypercholesterolemia; f, female; m, male; m+f, male and female; MI, myocardial infarction.

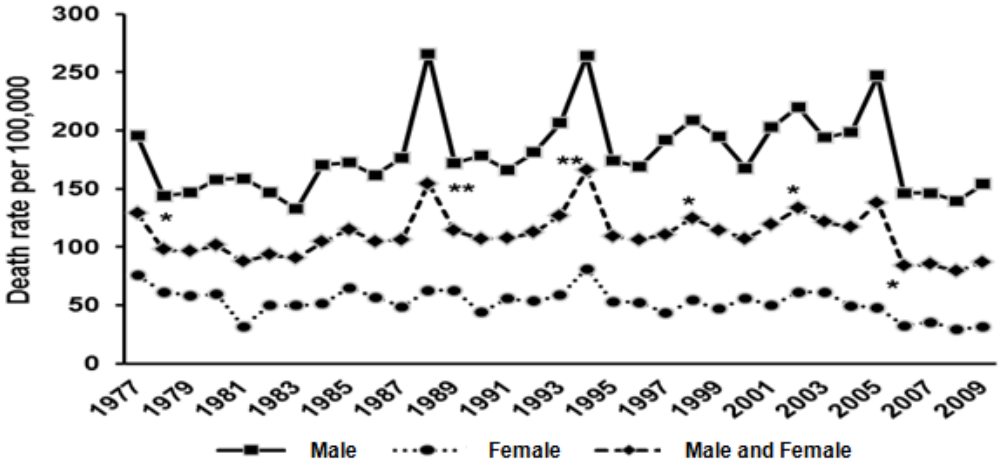


**Figure 2.** Annual myocardial infarction mortality rates among 25 to 64-year-old residents of Novosibirsk (deaths per 100,000 population). *p<0.05; **p<0.01.

were recorded in the youngest age groups in both genders. Unlike mortality, dynamic changes in lethality during the entire period of study were caused by the MI deaths in both males and females.

In both gender groups, prehospital mortality and lethality prevailed during all years of the study (Figure 4). We found that decline in mortality and lethality in 1977 and 1978 was caused by drop in in-hospital deaths. At the same time, the decline in mortality in 2006 was caused by a lower number of the prehospital MI events. Increase in MI mortality and lethality through the entire period of the study was associated with the higher rates of prehospital MI deaths.

It should be noted that downward trend in the female lethality in 2008 and 2009 was caused by the in-hospital events.

The 18-year long study (from 1977 to 1998) showed that the MI mortality rates were 2 to 3-fold higher compared to the death rates caused by alcohol abuse with exception of a period of profound social reorganization in 1994 when those rates were equal ($X^2$ = 8.4 , $\nu$ = 1, p < 0.01; $X^2$ = 14.59, $\nu$ = 1, p < 0.002) (Figure

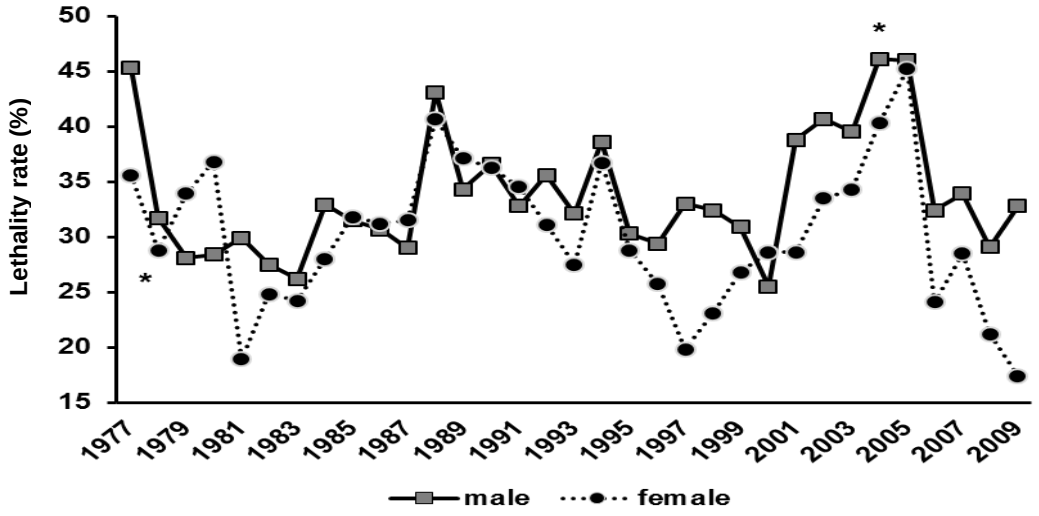


**Figure 3.** Myocardial infarction (MI) lethality (%) among 25–64-year-old residents of Novosibirsk. *p<0.05.

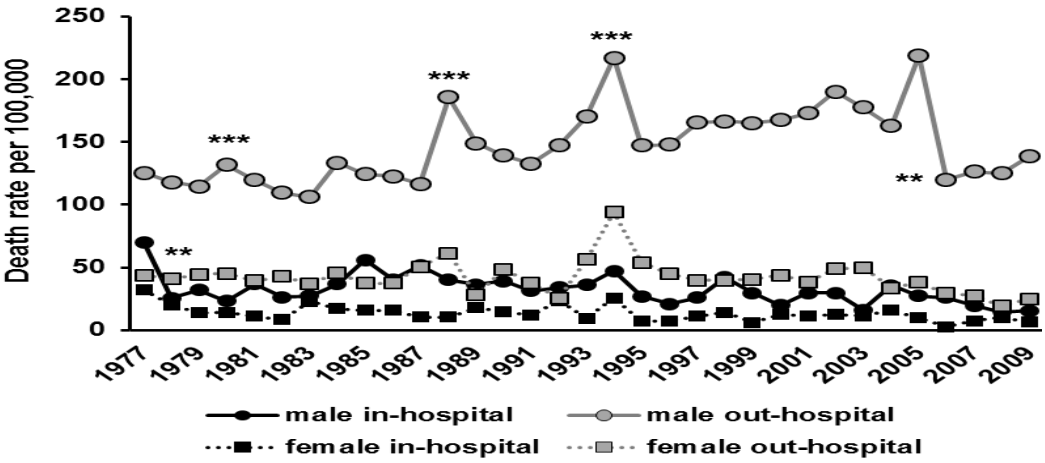


**Figure 4.** Annual myocardial infarction (MI) mortality rates among 25 to 64 year-old residents of Novosibirsk in regard to site of death (deaths per 100,000 population). **p<0.01; ***p<0.001.

5).

Temporal changes in the levels of both somatic and behavioral risk factors (arterial hypertension, smoking, hypercholesterolemia, and obesity) and psychosocial risk factors of ischemic heart disease (IHD) were determined based on the results of four screening studies of the representative random samples from 25 to 64-year-old population of both sexes in the districts of Novosibirsk in 1984, 1988, and 1994. No significant changes in the levels of the somatic and behavioral risk factors were found (Figure 1).

Significant temporal changes in the prevalence of anxiety measured by using the Spielberger's test were detected in the population according to three screening studies in 1984, 1988, and 1994. Anxiety level increased from 35% to 52%. At the same time, SNI significantly decreased in a period from 1984 to 1994 ($\chi^2 = 35.952$, $n = 6$, $p < 0.001$) (Figure 5). At the same time, SNI significantly decreased in a period from 1984 to 1994 ($\chi^2 = 35.952$, $n = 6$, $p < 0.001$). No statistically proven temporal changes in the levels of anxiety, ICC, and SNI were found in the fourth screening study.

Males with the high anxiety levels had a significantly higher relative risk (RR) of MI development compared to the individuals who had medium level of anxiety. During a 20-year period (from 1984 to 2004), RR was initially increasing from RR = 2.5 for five years (95% CI = 1.63–4.62, $p < 0.001$) to RR = 3.1 for ten years

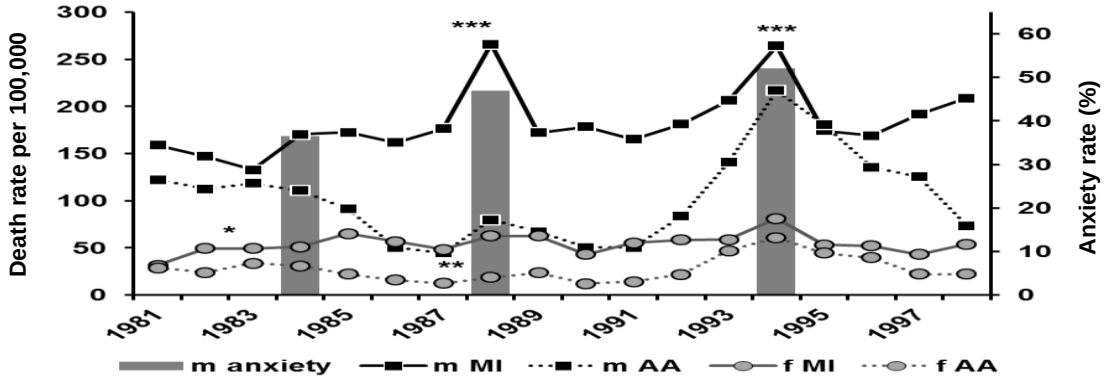


**Figure 5.** Annual myocardial infarction (MI) and alcohol abuse (AA) mortality rates (per 100,000 population) among 25 to 64 year-old residents of Novosibirsk and psychosocial factors (anxiety) in males. *p<0.05; **p<0.01; ***p<0.001. AA, alcohol abuse; MI, myocardial infarction; f, female; m, male.

(95% CI = 1.48–5.61, $p < 0.001$), eventually decreasing toward the end of a 20-year period to RR = 2.7 (95% CI = 1.27–5.71, $p < 0.05$).

## DISCUSSION

Our results demonstrated that MI morbidity in a high risk population of the city of Novosibirsk in Russia was among the highest in the world World Health Organization 1985, 1987, 1988). Thirty three-year long study of the dynamic changes in the MI rates showed steady state stabilization of MI incidence except its significant increase in 1988, 1994, and 1998 and significant decrease in 2002, 2003, 2004, and 2006. We would like to make a point that the MI events in males of the older age groups contributed to the significant increase in MI morbidity in 1988. In contrast, the MI incidence rates in 1994 and 1998 increased mostly due to higher morbidity among females in almost all age groups (except 25 to 34-year-old). Only one group of males (55 to 64-year-old) showed the significantly increased MI incidence rates in 1994 and 1998. The MI mortality and lethality rates remained steady during the entire 33-year period of the study except for the years from 1977 to 1978 when they decreased and except for 1988, 1994, 1998, and a period from 2002 to 2005 when the rates increased. Age-dependent changes in mortality resembled those of morbidity. The MI death rates in males exceeded mortality in females by 2 to 3 times. At the same time, the MI deaths among both males and females contributed to the changes in lethality during the entire period of study.

Analysis of the mortality and lethality trends in terms of a site of death showed that the prehospital mortality and lethality rates prevailed over in-hospital rates during all years of the study. A significant decline in mortality and lethality in males as well as similar tendency in females were found to be associated with early hospital admission of MI patients resulting, in turn, in the lower rates of complications and recurrent MI events (Gafarov, 1982). The study showed that an increase in MI mortality and lethality in males and females in 1988, 1994, 1998, and from 2002 to 2005 was associated with the higher number of sudden prehospital deaths. An increase in the prehospital mortality rates was found in males in 1988 and from 2002 to 2005 and in both males and females in 1994 and 1998; the trend in 2009 was caused by the MI events in both males and females.

Paradoxical absence of the expected reduction in MI morbidity at a time of decreased MI mortality and lethality in 1977 and 1978 as well as decrease in the morbidity rates at a time of the mortality and lethality increase in 2002, 2003, and 2004 may be explained by improved management of medical assistance for patients in the first instance and some disorganization in cardiac care in the second example.

We could not find associations between the changes in the MI rates and the levels of the main IHD risk factors which did not significantly change over time. This was likely due to the fact that the risk factor prevalence in the population was very high. No association between the MI rates and ecological factors was found as well (Gafarov, 1993). Strong associations between the MI rates and the psychosocial factors (increase in anxiety level) were demonstrated based on the results of three screening studies. Amplitude of anxiety level reflected the level of social stress in the population. Therefore, the rates of MI morbidity, mortality, and lethality were the markers of growing social and economic instability in the society. This conclusion was confirmed by observation of decline in the MI morbidity and mortality rates in 2006. We cannot rule out that this happened due to alleviation of social tension in the society that is, decrease in the levels of psychosocial risk factors and augmentation of social support at that time. A period from 2006 to 2007 and the

first half of 2008 were the most favorable years for Russia. During those years, the business revenues significantly grew leading to the higher budget revenues; human wellbeing improved; the government began to support national projects stimulating demographic growth, physical culture and sports, medicine, education, and home mortgage programs; economic development resulted in creation of new jobs; the stabilization funds were established. Upon those measures, people started to feel more stable; confidence in the future improved; social tension was alleviated. However, all those implicit indicators were indirectly associated with each other. Direct confirmation of an idea that the MI morbidity, mortality, and lethality rates can be considered as the markers of growing social and economic instability was the fact that the high anxiety level was associated with the significantly higher RR for MI development according to the results of the 20-year long study in CVD-free cohort.

Our study showed that the MI mortality rates exceeded the death rates caused by alcohol abuse by 2 to 3 times except for a period of profound social reorganization in Russia in 1994 when those rates were equal.

## SUMMARY

1. We found that the MI morbidity rates in a 25 to 64-year-old high risk population of the city of Novosibirsk in Russia were among the highest in the world.
2. The MI incidence rates remained steady over the entire period of the 33-year long population-based study except significant increase in 1988, 1994, and 1998 and significant decrease during a period from 2002 to 2004 and in 2006. The mortality and lethality changes resembled the dynamics of morbidity except decline in 1977 and 1978 and increase from 2002 to 2005. The prehospital mortality and lethality rates significantly exceeded the rates of in-hospital death events. An increase in mortality and lethality in 1988, 1994, 1998, and from 2002 to 2005 was caused by a higher number of prehospital deaths, whereas decrease in the rates in 1977 and 1978 was related mainly to in-hospital mortality and lethality.
3. Mortality and lethality decrease during a period of steady MI morbidity suggested improvement of cardiac care; increase in mortality and lethality at a time of decreased MI morbidity indicated disorganization of medical assistance for cardiac patients.
4. Analysis of the behavioral and somatic IHD risk factors in the population of the city of Novosibirsk during the 33-year period did not reveal significant temporal changes. At the same time, a significant increase in the levels of psychosocial risk factors was detected over the same period.
5. Indirect evidence suggested that the MI morbidity, mortality, and lethality rates were the markers of growing social stress in the society. Direct confirmation of this thesis was the significant MI RR increase in the individuals with the high anxiety levels according to the 20-year long study of CVD-free cohort.
6. Myocardial infarction mortality exceeded deaths caused by alcohol abuse by 2 to 3 times and was the main component of the increase in mortality of urban population in Russia.

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