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Original Research Article

Trends of myocardial infarction morbidity and its associations with weather conditions

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ABSTRACT

Objective: The aim of this study was to assess the trends of myocardial infarction (MI) morbidity and evaluate the associations with some meteorological factors.

Materials and methods: Data on MI morbidity were collected from Kaunas ischemic heart disease registry and information about meteorological factors from Kaunas meteorological station was collected.

Results: The overall morbidity rates of acute MI among men aged 25–64 increased by 2.0%/yr. ($P = 0.02$), whereas among women did not change significantly (+1.2%/yr., $P = 0.2$) during 1995–2007. Among men aged 65–84 the overall morbidity rates of MI were without significant changes (−1.0%/yr., $P = 0.3$) and among women decreased significantly by −1.7%/yr. ($P = 0.03$). During 1995–2000, a weak inverse significant correlation between atmospheric air temperature and morbidity of MI ($r = -0.05$, $P = 0.019$) was documented (in women and the elderly $r = -0.045$ and −0.048, respectively, $P < 0.05$). Weak correlation between atmospheric air wind speed and MI morbidity in women ($r = -0.042$, $P = 0.05$) and in population of older age ($r = -0.056$, $P = 0.099$) was determined. In men and in elderly population a direct weak correlation between atmospheric pressure and MI morbidity was found ($r = 0.114$ and 0.166, respectively, $P < 0.01$). In this study monthly and seasonal variation of MI rates were observed. In winter period MI rates were higher to compare with other seasons ($\chi^2 = 18.682$, $df = 3$, $P < 0.0001$).

Conclusions: The overall morbidity rates of MI increased among Kaunas men aged 25–64 and tended to increase among women, whereas among men aged 65–84 MI morbidity trends were without statistically significant changes and significantly decreased among women

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during 1995–2007. Weak inverse correlations between atmospheric air temperatures, rainfall level and direct correlation between air wind speed, atmospheric pressure and MI morbidity were established. Months/seasonal variations during analyzed period were observed.

1. Introduction

The half of all death causes, one-third for disability and 15%–20% of visits to health care institutions are responsible cardiovascular diseases (CVD) in Lithuania [1,2]. The research on morbidity and mortality from CVD in Lithuanian population showed that during the past two decades these rates has been increasing more rapidly than in the other Baltic countries [3]. It was determined, that some socio-demographic and behavioral factors as arterial hypertension, dyslipidemias, smoking and others influenced morbidity and mortality from CVD, especially from coronary heart disease (CHD) [4]. Some researcher's occurrence of myocardial infarction (MI) associated with meteorological conditions such as atmospheric air temperature, relative humidity, wind speed, air pressure and others [5–8]. Other investigators increased incidence of MI associated with weather seasonal variations and rapid changes of meteorological factors during a day [9]. Weather associations with morbidity and mortality from CHD have been reported in different countries [10,11]. This phenomenon has been attributed to weather components variations. In particular, some studies have reported increased CHD incidence and mortality during winter period [12,13]. Consensus is lacking, however, on whether this phenomenon reflects variations in incidence of MI and in case lethality. Variations in emergency admission rates and trial recruitment of patients suffering from MI [6,14] are well described, and a number of epidemiological studies have reported a highest winter MI incidence, with similar seasonal trends in all studied subgroups, including men and women, middle-aged and elderly patients, patients from northern and southern countries and different types of MI [15]. This relationship could be actually U-shaped, with higher incidence and mortality also in extremely low or high temperatures [16]. These seasonal changes do not seem universal and as they are absent near the equator or in sub-polar regions with less temperature fluctuations unlike those found in temperate regions [17,18]. Up to now the effect of weather variables on MI has not been assessed in Lithuania, a country with an averaged cold and wet climate. Some meteorological factors other than air temperature were less frequently studied. A better understanding of these meteorological patterns may provide additional measures in CVD prevention.

The aim of this study was to determine the trends of MI morbidity and evaluate the correlations of meteorological factors such as atmospheric air temperature, rainfall, wind speed, atmospheric pressure and morbidity of myocardial infarction.

2. Materials and methods

Myocardial infarction morbidity data were obtained from Kaunas population-based ischemic heart disease (IHD) registry. The methods used for the MI data collection were those applied by the WHO for the international MONICA (MONItoring of trends and determinants in CArdiovascular disease) project and were described in detail elsewhere [19].

The morbidity trends of MI among Kaunas population were evaluated during period from 1995 to 2007 years. According to the IHD register data, during this period 6753 cases of MI, 3895 (57.7%) in Kaunas men and 2858 (42.3%) in women were reported. The event number of MI occurring during the same period was 2999 (44.4%) in persons aged 25–64 years and 3754 (55.6%) in persons aged 65–84 years.

Weather conditions such as atmospheric air temperature, wind speed, rainfall and atmospheric pressure were analyzed in 1995–2000. Data about weather conditions such as atmospheric air temperature ($n = 2192$ days), level of rainfall ($n = 2192$ days), wind speed ($n = 2192$ days) and atmospheric pressure ($n = 365$ days) were collected from Kaunas meteorological station. Daily variations of atmospheric air temperature were measured in absolute temperature units in Celsius scale. Level of rainfall is measured in millimeters (mm) per day, level of wind speed is measured in meters per second and level of atmospheric pressure is measured in mm of Hg as averaged per day. Months/seasonal atmospheric air temperature, level of rainfall, wind speed and atmospheric pressure and MI rates variation were measured during four seasons: spring (from March to May), summer (from June to August), autumn (from September to November) and winter (from December to February) months.

2.1. *Statistical analysis*

Statistical data analysis was performed using the SPSS program version 13.0 and MS Office Excel software package. MI morbidity rates were calculated per 100 000 inhabitants per year and were age-standardized using the direct method and the Segi's world population as a standard. Trends were analyzed using the method of linear regression on logarithms of the age-standardized annual overall morbidity rates. The regression coefficient multiplied by 100 is given as an average yearly change. Spearmen correlation and linear regression analyses between events of MI and weather conditions levels was assessed. Month/seasonal variations were calculated by nonparametric χ^2 criterion. A P value of <0.05 was considered as statistically significant.