Ambient temperature and myocardial infarction in Minsk 2012-2016 – Registry-based study

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Introduction

Rapid changing of climate has a huge influence on the population, especially on health. Cardiovascular diseases are among the hot spots. Carried out in 2010, the Global Burden of Diseases (GBD 2010) ranked acute and chronic heart disease as the first most common cause for mortality worldwide.

Aim

The objective of this study was to investigate the association between daily ambient temperature and myocardial infarction hospitalisations (MI) using a case-crossover design in Minsk, Belarus (2013-2016).

Material and methods

From Ambulance Registry of Minsk, we obtained records 01Jan2013-31Dec2016 with non-missing doctor-validated ICD10 codes to determine MI (I21xx). Using official temperature data and time of the admission records, we determined 24h average temperature before the MI cases and each control periods. The time-stratified case-crossover design was applied to investigate the association between temperature and MI hospitalisations. Daily temperature during MI cases were matched with 4 controls: lag(-14), lag(-7), lag(+7) and lag(+14). We applied conditional logistic regression analysis to assess the association. To investigate potential departures from linearity we used restricted cubic splines corresponding to four knots at fixed percentiles 5, 35, 65, and 95 of the distribution).

Results

During the period, we observed 24,052 MI cases (61% males, mean age 59.1 [Standard Deviation -Std.Dev- 14.1] years), temperature varied from -4° to 34° C (mean 15.2[Std.Dev 7.1]°) in April-September period and from -22° to 18.5° (mean +0.1 [Std.Dev 6.9]°) in October-March period. Our analysis suggests a non-linear U-shape dose-response relationship between MI hospitalisation and daily temperature (Figure 1) with the lowest risk at the average daily temperature at +7°C. Both higher and lower temperature outside of optimum of +7°C was associated with a statistically significant higher risk of MI hospitalisation. Moreover, the low temperature below -10°C was associated with the increased risks of MI hospitalisations of 2-4 folds comparing to the optimum temperature level.
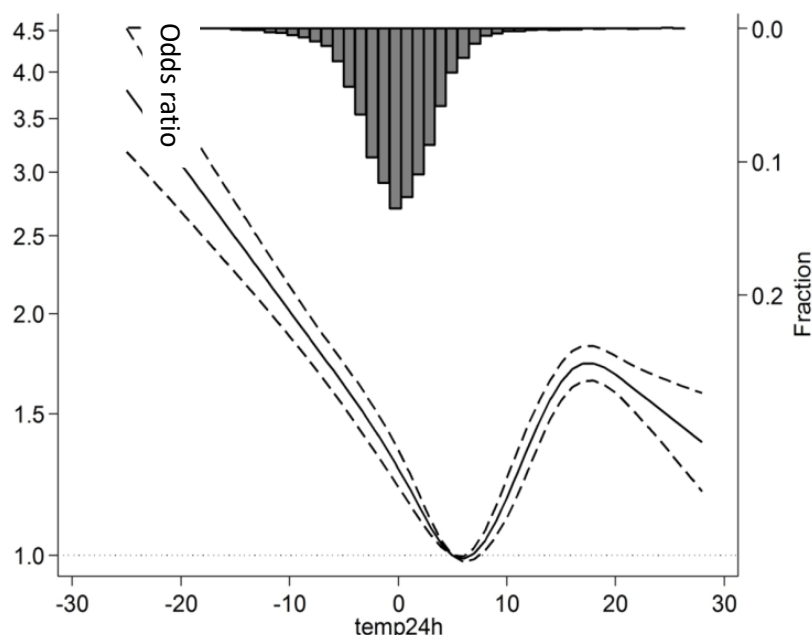
Figure 1. Association of ambient 24 h daily average temperature and myocardial infarction hospitalisation in Minsk, Belarus during 2013-2016. The histogram shows the distribution of 24,052 MI hospitalisations over the daily temperature at the day of the hospitalisation.

Conclusions

Our results suggest a non-linear U-shape dose-response relationship between MI hospitalisation and the daily average temperature in Minsk with the lowest risk at +7°C (optimum). The low temperature (< -10°C) was associated with increased risks 2-4 folds of MI comparing to the optimum level. Our findings may have important implications in the organisation and planning of emergency health care in Minsk and the Republic of Belarus to facilitated prevention and better treatment of patients with myocardial infarction.