

## Pollution and weather influence outcomes after heart attack

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Pollution and weather influence outcomes after a heart attack, according to research presented at ESC Congress today by Ms Aneta Cislak, research fellow in the Silesian Centre for Heart Diseases, Medical University of Silesia in Zabrze, Poland.

"Weather changes like rain or heat affect our daily activity and even our productivity at work," said Ms Cislak. "Since this influence is so noticeable we were interested to see if weather has any connection with cardiovascular diseases including acute coronary syndromes. Moreover, air pollution affects our health, especially in highly industrialised areas. We performed our research in Silesia, the most urbanised and industrialised region in Poland."

The study examined the relationship between environmental factors and severity of clinical status and short-term prognosis in patients with non ST-segment elevation <u>acute coronary syndromes</u> (NSTE ACS). These include NSTE myocardial infarction (NSTEMI) (<u>heart attack</u>) and unstable angina.

The study enrolled 2 388 patients admitted for NSTE ACS between 2006 and 2012. Data on meteorological conditions and air pollutants was obtained from the Silesian Air Monitoring Website. Weather factors included atmospheric pressure, air temperature, wind speed, humidity and total solar radiation intensity measured on the day of admission. Air concentrations of the most common pollutants (sulphur dioxide, nitric oxides, carbon monoxide, ozone and particulate matters) were recorded.



Weather and pollution parameters were correlated with clinical status expressed by left ventricular ejection fraction, a measurement of how well the heart pumps with each beat;2 MI rates; GRACE risk score, which assesses future risk of death or MI;3 and CRUSADE Bleeding Score, which assesses bleeding risk.4

The researchers found that patients with high risks of MI and bleeding and low left ventricular ejection fraction were admitted for NSTE ACS on warmer, sunnier, drier and windy days with higher carbon monoxide and ozone air concentrations (Figure 1). Ms Cislak said: "These were the sickest patients. The findings may be explained by the fact that their organs may be more sensitive to weather changes, leading to decompensation."

Treatment with percutaneous coronary intervention (PCI) to widen blocked coronary arteries was more frequently successful when the weather was sunnier and less windy but colder and with lower concentrations of ozone, carbon monoxide and nitric oxides (Figure 2). "One of the possible explanations for this finding is that air pollutants like <u>carbon monoxide</u> bind irreversibly to haemoglobin and impair blood oxygen transport. This can cause hypoxia and lead to worse clinical status and less successful treatment," said Ms Cislak.

Higher in-hospital and one month mortality was observed on colder, more sunny and less windy days (Figure 3). "For now, we are not able to explain this phenomenon, but we hope that further studies will help us to verify and understand it better," said Ms Cislak.

She added: "This was a small observational study and our analysis was univariate so we cannot rule out the possibility that the associations were caused by the co-existence of other factors. Multivariate analysis is needed to confirm our observations. Possible mechanisms for our observations are various. They may include seasonal growth of death



rates reported in the general population in Poland. Also the negative influence of air pollutants on the cardiovascular system could be explained by their connection with inflammation, affecting the respiratory system and as an effect impaired oxygenation. There is no doubt that the analysed factors may potentiate or diminish each other's effects e.g wind purifies the air by blowing pollutants or lower temperature causes more intensive home heating and combustion products emission."

Ms Cislak concluded: "It should be remembered that not only do humans influence the environment, but the environment also influences humans. Our study suggests that environmental factors may affect the severity of clinical status and short-term prognosis in patients with NSTE ACS. We are now investigating the impact of meteorology and <u>air pollution</u> on 600 000 patients in the Silesian Cardiovascular Database who were hospitalised with cardiovascular diseases in the last ten years in Silesia."

**More information:** Ms Cislak will present the abstract 'The relationship between the environmental factors and severity of clinical status and short-term prognosis for the patients with non-ST elevation acute coronary syndromes'

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