

Pollution and winter linked with rise in heart attack treatment

August 23 2019

ESC CONGRESS 2019 - 31 August-4 September 2019 - Paris - France

N° 81853

Increased air pollution expressed as PM10 concentration and winter time are related to the frequency of percutaneous coronary interventions in patients with acute coronary syndromes

Topic : 28.8.1 - Environmental Aspects of Heart Disease

Option : No Options

Category : Bedside

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Background. According to epidemiological studies, increased air pollution has negative impact on the cardiovascular system. However, the extent of the air pollution's impact on the frequency of the occurrence of specific subtypes of coronary artery diseases (CAD) has not yet been established with absolute certainty.

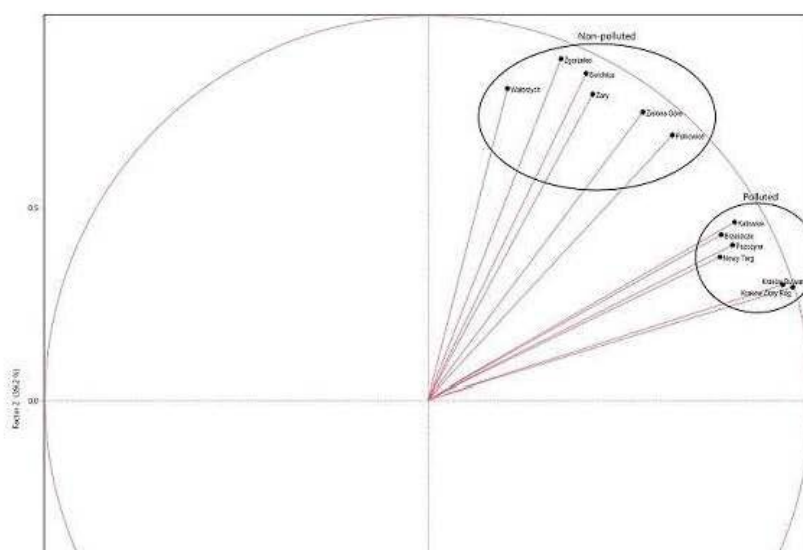
Purpose. The aim of the study was to assess the relationship between increased air pollution expressed as particulate air matter (PM10) concentrations and the occurrence of acute coronary syndromes (ACSs).

Methods. Based on the data published by the Chief Inspectorate for Environmental Protection, we selected six cities (six catheter laboratories [cath labs]) with low pollution according to PM10 ("non-polluted") and five cities (six cath labs) with the highest pollution ("polluted"). These locations served as a basis for the determination of 24/7 cath labs and the frequency of percutaneous coronary interventions in patients (PCIs) with subsequent types of CAD with special outlook on the ACSs. The current study accounted 10,239 patients in the polluted area and 5,648 patients from the non-polluted region treated with PCI and included patients with stable angina and ACSs. Analysing the period of 365 days, the number of patients undergoing angioplasty in monitored cath labs and the mean daily concentration of PM10 in all selected cities were calculated for each day. In order to better visualise air pollution trends and the frequency of performing PCI in patients with ACS, we have created new time intervals for weeks. Additionally, due to the difference in pollution levels, the analysed period was divided into winter (13 weeks) and non-winter weeks (39 weeks).

Results. The annual average concentration of PM10 amounts to 50.95 µg/m³ in polluted cities and 26.62 µg/m³ in non-polluted ones, which was significantly different ($p < 0.01$) (Fig. 1). It was proven that for both groups, the rise in PM10 pollution levels is connected with the increased frequency of PCIs in patients with ACSs (polluted $p < 0.01$ and non-polluted $p < 0.01$ areas). Moreover, we calculated that in the non-polluted regions, the increase in PM10 concentration by every 1 µg/m³ causes 0.22 additional ACS angioplasties per week. In polluted regions, the same increase in PM10 concentration causes 0.18 additional ACS angioplasties per week. In non-winter weeks, the mean number of ACS PCIs expressed in promiles was lower than in winter weeks in polluted (18.56 ± 2.41 vs. 21.23 ± 3.98 , $p = 0.03$) and non-polluted cities (18.68 ± 2.98 vs. 20.88 ± 2.57 , $p = 0.02$).

Conclusions. The study shows that the increase in air pollution expressed as PM10 concentration and winter time influences the frequency of ACS related PCIs.

Figure 1. Biplot chart according to the extent of pollution expressed as PM10 and sample size for selected Cathlabs.



Heavily polluted areas have a higher rate of angioplasty procedures to treat blocked arteries than areas with clean air, according to research to be presented at ESC Congress 2019 together with the World Congress of Cardiology. Procedures are even more common in winter, the most polluted time of year. Credit: European Society of Cardiology

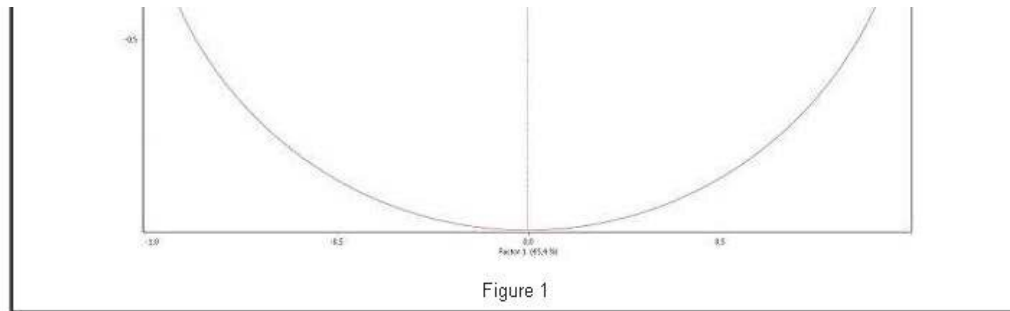
Heavily polluted areas have a higher rate of angioplasty procedures to treat blocked arteries than areas with clean air, according to research to be presented at ESC Congress 2019 together with the World Congress of Cardiology. Procedures are even more common in winter, the most polluted time of year.

Study author Dr. Rafal Januszek of the University Hospital in Krakow, Poland said: "Epidemiological studies have reported negative impacts of pollution on the cardiovascular system but the effects on specific diseases were unclear. We also show for the first time that patients from areas with cleaner air are more sensitive to changes in pollution, while those from more polluted cities can adapt to fluctuations."

Using [particulate matter](#) (PM) 10 levels published by the Chief Inspectorate for Environmental Protection in Poland, six unpolluted cities and five polluted cities were selected for the study. PM10 are particles ten micrometres or less in diameter. Sources include [industrial processes](#) like iron making and quarrying, lawn mowing, wood and coal stoves, bushfires, [dust storms](#), and vehicle exhaust emissions.

The study enrolled 5,648 patients from unpolluted cities and 10,239 patients from polluted cities. All patients underwent stent insertion ([percutaneous coronary intervention](#); PCI) to open arteries blocked due

to acute coronary syndromes (heart attack or unstable angina). PCI data were obtained from the ORPKI Polish National PCI Registry.



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Dates of PCI procedures were matched with air quality on the same day during a 52-week period. Analyses were also performed to compare winter versus non-winter weeks because pollution levels rise during winter.

The annual average PM10 concentration was significantly higher in polluted cities (50.95 $\mu\text{g}/\text{m}^3$) compared to unpolluted cities (26.62 $\mu\text{g}/\text{m}^3$). In both polluted and unpolluted areas, a rise in PM10 concentration was significantly associated with a greater frequency of PCI.

Patients in cities with [clean air](#) were more sensitive to pollution rises, with each 1 $\mu\text{g}/\text{m}^3$ increase in PM10 concentration linked to 0.22 additional PCIs per week. While in polluted cities, the same rise in PM10 was linked with just 0.18 additional PCIs per week.

Regarding the seasonal effect, the PCI rate was significantly lower in non-winter, compared to winter, weeks in both polluted and clean cities. "The higher incidence of PCI in winter is related to greater air pollution during this period," said Dr. Januszek. "This is due to several factors such as artificial heating and the resulting smog."

He concluded: "The study shows that the incidence of [acute coronary](#)

[syndromes](#) treated with PCI was higher in winter and rose along with increasing pollution, and this rise was higher in regions with initially cleaner air, if taking the same increment in pollution into account. This is further evidence that more needs to be done to lower pollution levels and protect the public's health."

More information: The abstract "Increased air pollution expressed as PM10 concentration and winter time are related to the frequency of percutaneous coronary interventions in patients with acute coronary syndromes" will be presented during [Poster Session 4: Clinical epidemiology and prevention](#) on Monday 2 September at 08:30 to 12:30 CEST in the Poster Area.

Provided by European Society of Cardiology

Citation: Pollution and winter linked with rise in heart attack treatment (2019, August 23)
retrieved 25 April 2024 from
<https://medicalxpress.com/news/2019-08-pollution-winter-linked-heart-treatment.html>

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