

# Rapid pollution increases may be as harmful to the heart as absolute levels

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Rapid increases in pollution may be as harmful to the heart as sustained high levels, according to research published today in the *European Journal of Preventive Cardiology*, a European Society of Cardiology journal. The authors urgently call for confirmatory studies as even residents of clean air cities could be at risk.

There is longstanding evidence that exposure to high concentrations of air pollution increases the risk for several diseases including heart attacks and European Union (EU) statutory pollution limits are based on absolute upper values.

However, this study investigated whether rapid increases in pollution increase the risk of heart attack, independently of an absolute threshold. It also looked at whether an association between heart [attacks](#) and changes in air pollution exists in clean air cities where concentrations of air pollution vary but do not exceed EU limits.

The study was conducted in Jena, Germany, a city with 100,000 residents and only a few days over the last several years during which concentrations of some air pollutants exceeded EU daily limits. All patients living within 10 km of Jena who had a heart attack and were admitted to Jena University Hospital between 2003 and 2010 were included.

Each of the 693 patients served as his or her own control. Concentrations of air pollutants one, two, and three days before heart attack symptoms

were compared to concentrations in the previous and following week. The researchers analysed whether there were rapid variations in air pollution before the heart attack.

Increases of nitric oxides of more than 20  $\mu\text{g}/\text{m}^3$  within 24 hours were associated with a more than doubled risk of heart attack.

Senior author Dr Florian Rakers, a researcher and doctor at Jena University Hospital, said: "Our study suggests that the risk of heart attack associated with nitrogen oxides depends on the dynamics and extent of increases, and not only on exposure to high concentrations."

The researchers were surprised by the magnitude of the association. Dr Rakers said: "The risk of [heart attack](#) more than doubled after a 24 hour increase in nitric oxides of more than 20  $\mu\text{g}/\text{m}^3$ . The impact of rapid increases in air pollutants on [heart](#) health may be at least as important as absolute concentrations."

He continued: "The adverse effects of rapid rises in pollution can occur in smaller cities. Increases of nitric oxides by more than 20  $\mu\text{g}/\text{m}^3$  within 24 hours happen more than 30 times per year in Jena, which is known as a 'clean air' city where statutory limits for nitric oxides are generally not violated."

Ground traffic and especially diesel cars are the primary source of nitric oxides in the EU. The study did not investigate the cause of rapidly changing pollution levels, but Dr Rakers said they could be due to irregular events that lead to more traffic than usual - for example the start of holidays or meteorological conditions associated with smog.

The researchers urgently called for larger studies to confirm the association between rapid increases of air [pollution](#) and cardiovascular risk.

The paper states: "Even though the ambient air in the city of Jena is comparably clean, the significant association between rapid changes in nitrogen oxides and onset of myocardial infarction (MI) suggests that the current EU statutory limits do not sufficiently protect against effects relating to the cardiovascular health of the population. A more specific definition and stricter implementation of statutory limits for rapid increases of [nitrogen oxides](#) are potentially needed to address this issue and to close this gap regarding the risk of MI."

Dr Rakers said: "Once our findings are replicated, the EU should discuss statutory limits on rapid increases of nitric oxides. This would require more efforts to reduce these [air pollutants](#), such as banning diesel cars that exceed EU emission limits."

**More information:** Rasche M, et al. Rapid increases in nitrogen oxides are associated with acute myocardial infarction: A case-crossover study, *European Journal of Preventive Cardiology* (2018). [DOI: 10.1177/2047487318755804](#)

Provided by European Society of Cardiology

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