Particulate matter and NO$_2$ air pollution trigger ST-elevation myocardial infarction: A case cross-over study of the Belgian STEMI registry 2009-2013

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Disclosure: None

Collaborators:
DECLARATION OF INTEREST

- I have nothing to declare
• **Definition of air pollution (AP)**

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• **Global health effect of AP:**
  “Urban outdoor air pollution is estimated to cause 1.3 million deaths worldwide per year.” Air quality and health Fact sheet N° 313 W.H.O. September 2005 (updated 2011)

• **Air pollution and acute myocardial infarction (AMI):**
  Previous studies have shown that AP increases the global incidence of AMI but:

  *ST elevation myocardial infarction (STEMI) is the most severe form of AMI*

  *No clear demonstration of an influence of AP exposure on STEMI onset*
Aims and methodology

**Aims:**

1) Does air pollution affect the incidence of STEMI?
2) Is this effect more related to particle or gaseous pollutant?
3) Are there some vulnerable populations to the effect of AP?

**Methodology:**

- 11428 STEMI patients between 2009 and 2013 were included from the Belgian Interdisciplinary Working Group on Acute Cardiology (BIWAC) STEMI registry.
- Air pollution data were extracted from Belgian Interregional Environment Agency (IRCEL – CELINE) monitoring stations.
- Relation between AP and STEMI was addressed by a case cross-over statistical analysis (P. Collart, Research Centre in Epidemiology, ULB).

Meuse Valley Fog Dec. 1930

Air pollution monitoring network

The RIO map
Results

Global population

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>O3</td>
<td>0.9</td>
</tr>
<tr>
<td>NO2</td>
<td>0.95</td>
</tr>
<tr>
<td>PM2.5</td>
<td>1</td>
</tr>
<tr>
<td>PM10</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Subgroup analysis

- Effect of air pollution on STEMI was only observed in men,
- Patients aged 75 years and above developed more STEMI in relation to PM10 exposure, while those 54 years and under were more susceptible to NO2,
- No clear predisposition to the effect of AP of diabetic, hypertense or coronary artery diseased populations,
- AP increased the incidence of STEMI but did not affect in-hospital STEMI mortality.
## Results

<table>
<thead>
<tr>
<th></th>
<th>Percentiles</th>
<th>Mean ± sd</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>-1.1</td>
<td>6.0</td>
</tr>
<tr>
<td>PM$_{10}$ (µg/m$^3$)</td>
<td>10.0</td>
<td>14.9</td>
</tr>
<tr>
<td>PM$_{2.5}$ (µg/m$^3$)</td>
<td>5.1</td>
<td>8.2</td>
</tr>
<tr>
<td>NO$_2$ (µg/m$^3$)</td>
<td>10.3</td>
<td>15.9</td>
</tr>
<tr>
<td>O$_3$ (µg/m3)</td>
<td>10.9</td>
<td>28.8</td>
</tr>
</tbody>
</table>

Abbreviations: PM$_{10}$: particulate matter with aerodynamic diameter<10µm; PM$_{2.5}$: particulate matter with aerodynamic diameter<2.5µm; NO$_2$: nitrogen dioxide.

EU 2008 *
Air Quality Standards
(1 year Averaging period)

- 40 µg/m3
- 25 µg/m3
- 40 µg/m3
- (N.A for 1 year)

*: Directive 2008/50/EC
Conclusions

We observe for the first time at a national level, and despite clear observance of EU air quality guidelines, that:

1) Particulate and NO2 air pollution are associated with an increased risk of STEMI of respectively 2.8 and 5.1% for each 10 μg.m⁻³ rise.

2) The detrimental impact of NO2 exceeds that of fine particles and this may be of particular concern in the younger population,

3) Despite increased risk of occurrence, no association between air pollution and mortality of STEMI was observed.