Abstract: P439

A global analysis of associations between fine particle air pollution and blood pressure, lipids, and glucose in patients with coronary heart disease of the Survey of Risk Factors (SURF) study

Authors:
MZ Zhao¹, GH Hoek², MS Strak², DEG Grobbee¹, IG Graham³, KKG Klipstein-Grobusch¹, IV Vaartjes¹, ¹University Medical Center Utrecht - Utrecht - Netherlands (The), ²Institute for Risk Assessment Sciences, Environmental epidemiology - Utrecht - Netherlands (The), ³Trinity College Dublin - Dublin - Ireland,

Topic(s):
Environmental and Occupational Aspects of Heart Disease

Citation:
Netherlands Organisation for Scientific Research (NWO; 0.22.005.021); Dutch Heart Foundation ('Facts and Figures')

Background: Studying the associations between particulate air pollution and cardiovascular risk factors on a global scale is challenging and rarely done. We aimed to determine the associations of long-term exposure to particles smaller than 2.5µm (PM2.5) with systolic and diastolic blood pressure (SBP/DBP), lipids (total, low-density, and high-density cholesterol), and glucose using existing data from 10 countries in Europe, Asia, and the Middle-East.

Methods: Cardiovascular risk factor data were obtained from the Survey of Risk Factors (SURF) for coronary heart disease (CHD) patients. Annual average PM2.5 concentrations were estimated using recent global WHO PM2.5 maps combining satellite and surface monitoring data for the location of the 71 participating centers. Associations of PM2.5 with risk factors were assessed by mixed-effect generalized estimation equation models adjusted by sex, age, exercise, and smoking. We assessed whether additional adjustment for country affected associations.

Results: 8392 patients (30% women) were included. Globally, an increase of 10 µg/m3 in PM2.5 was significantly associated with decreased BP and increased glucose. No associations were found with lipids. After controlling for country, an increase of 10 µg/m3 in PM2.5 was associated with decreased BP and increased LDL (SBP: -0.45mmHg, 95% CI: -0.85, -0.06;DBP: -0.47mmHg, 95% CI: -0.73, -0.20;LDL: 0.04mmol/L, 95%CI: 0.01, 0.08). The association with glucose attenuated (0.08mmol/L, 95% CI: -0.23, 0.16).

Conclusion: Global associations of PM2.5 and cardiovascular risk factors can be determined linking risk factor and geospatial air pollution data but the sensitivity of effect estimates to adjustment for country stress the need for multiple centers per country. After country adjustment, PM2.5 was associated with small increases in LDL and small decreases in BP.

<table>
<thead>
<tr>
<th>PM2.5 (µg/m3)</th>
<th>SURF Global</th>
<th>SURF Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>38.1±34.5</td>
<td>15.8±5.7</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>Changes (95%CI)</td>
<td>-0.45(-0.85, -0.05)</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>Changes (95%CI)</td>
<td>-0.47 (-0.73, -0.20)</td>
</tr>
<tr>
<td>TC (mmol/L)</td>
<td>Changes (95%CI)</td>
<td>0.02 (-0.03, 0.07)</td>
</tr>
<tr>
<td>LDL (mmol/L)</td>
<td>Changes (95%CI)</td>
<td>0.04 (0.01, 0.08)</td>
</tr>
<tr>
<td>HDL (mmol/L)</td>
<td>Changes (95%CI)</td>
<td>0.01 (-0.01, 0.03)</td>
</tr>
<tr>
<td>Glucose (mmol/L)</td>
<td>Changes (95%CI)</td>
<td>-0.08 (-0.24, 0.07)</td>
</tr>
</tbody>
</table>

SBP: systolic blood pressure; DBP: diastolic blood pressure; TC: total cholesterol. Changes in cardiovascular risk factors were assessed by 10 µg/m3 increased in PM2.5. Adjustments include gender, age, exercise, smoking habit, and country.
Abstract: A global analysis of associations between fine particle air pollution and blood pressure, lipids, and glucose in patients with coronary heart disease of the Survey of Risk Factors (SURF) study

Authors: MZ Zhao, 1 GH Hoek, 2 MS Strak, 2 DEG Grobbee, 1 IG Graham, 3 KKG Klipstein-Grobusch, 1 IV Vaartjes, 1

1 University Medical Center Utrecht - Utrecht - Netherlands (The), 2 Institute for Risk Assessment Sciences, Environmental epidemiology - Utrecht - Netherlands (The), 3 Trinity College Dublin - Dublin - Ireland, (The)

Topic(s): Environmental and Occupational Aspects of Heart Disease

Citation:

Background: Studying the associations between particulate air pollution and cardiovascular risk factors on a global scale is challenging and rarely done. We aimed to determine the associations of long-term exposure to particles smaller than 2.5µm (PM2.5) with systolic and diastolic blood pressure (SBP/DBP), lipids (total, low-density, and high-density cholesterol), and glucose using existing data from 10 countries in Europe, Asia, and the Middle-East.

Methods: Cardiovascular risk factor data were obtained from the SURveY of Risk Factors (SURF) for coronary heart disease (CHD) patients. Annual average PM2.5 concentrations were estimated using recent global WHO PM2.5 maps combining satellite and surface monitoring data for the location of the 71 participating centers. Associations of PM2.5 with risk factors were assessed by mixed-effect generalized estimation equation models adjusted by sex, age, exercise, and smoking. We assessed whether additional adjustment for country affected associations.

Results: 8392 patients (30% women) were included. Globally, an increase of 10 µg/m3 in PM2.5 was significantly associated with decreased BP and increased glucose. No associations were found with lipids. After controlling for country, an increase of 10 µg/m3 in PM2.5 was associated with decreased BP and increased LDL (SBP: -0.45mmHg, 95% CI: -0.85, -0.06; DBP: -0.47mmHg, 95% CI: -0.73, -0.20; LDL: 0.04mmol/L, 95%CI: 0.01, 0.08). The association with glucose attenuated (0.08mmol/L, 95% CI: -0.23, 0.16).

Conclusion: Global associations of PM2.5 and cardiovascular risk factors can be determined linking risk factor and geospatial air pollution data but the sensitivity of effect estimates to adjustment for country stress the need for multiple centers per country. After country adjustment, PM2.5 was associated with small increases in LDL and small decreases in BP.

SBP: systolic blood pressure; DBP: diastolic blood pressure; TC: total cholesterol. Changes in cardiovascular risk factors were assessed by 10 µg/m3 increased in PM2.5. Adjustments include gender, age, exercise, smoking habit, and country.