Effect of Air Pollution on Respiratory Diseases in Western China

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Outline

1 Geographic Position
2 Materials and Methods
3 Effect of air pollution on respiratory diseases in Lanzhou
4 Summary
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Background

Ambient air pollution is a global public health concern that is estimated to cause approximately 3.7 million premature deaths worldwide per year.

Lanzhou is one of the severely polluted cities in China, even in the world.
Geographical Position of Lanzhou

Lanzhou

Beijing

(36.03°N, 103.53°E)

(39.9°N, 116.3°E)
Geographical Position of Lanzhou

China

Yellow River

Takla Makan Desert

Gobi Desert
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Daily ER visits were collected between 1 March 2007 and 31 May 2011 from three large-scale comprehensive top-level hospitals in Lanzhou.

The daily ambient air concentrations of PM10, SO2 and NO2 in the urban district of Lanzhou.

Dust day: if there is a dust event, it is defined as a dust day.

Dust events: dust storms (horizontal visibility less than 1000 m), blowing dust (1000-10,000 m), and floating dust (more than 10,000 m)

Generalized additive model (GAM)

$$\log[E(Y_i)] = \alpha + s(\text{time,df}) + \text{DOW} + \text{Holiday} + s(\text{temperature,df}) + s(\text{humidity,df}) + \beta Z_t$$
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Air Pollution Index (API)

State Environmental Protection Administration uses 5 API levels to determine the air quality.

The API value in the range of 0-50 indicates excellent air quality (i.e. grade 1), 50-100 good air quality (i.e. grade 2); 100-150 slightly polluted (i.e. grade 3); 151-200, lightly polluted, 201-250 moderately polluted (i.e. grade 4A); 251-300 moderate-heavily polluted (i.e. grade 4B), and >300, heavily polluted.
RRs (95% CIs) of ER visits with an increase of 10 µg/m³ in air pollutants
RRs (95% CIs) of ER visits with an increase of 10 µg/m3 in air pollutants

age

sex
RRs (95% CIs) of ER visits with an increase of 10 µg/m³ in air pollutants
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RRs (95% CIs) of ER visits with an increase of 10 µg/m³ in air pollutants
RRs (95% CIs) per 10 µg/m3 increase in PM10, SO2 and NO2 on ER visits in single and multiple pollutant models

<table>
<thead>
<tr>
<th>Models/P</th>
<th>PM&lt;sub&gt;10&lt;/sub&gt;</th>
<th></th>
<th>SO&lt;sub&gt;2&lt;/sub&gt;</th>
<th></th>
<th>NO&lt;sub&gt;2&lt;/sub&gt;</th>
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</thead>
<tbody>
<tr>
<td>Non-dust days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>0.974 (0.96–0.99)</td>
<td>&lt;0.01</td>
<td>0.714 (0.63–0.81)</td>
<td>&lt;0.01</td>
<td>1.054 (1.04–31.07)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>+SO&lt;sub&gt;2&lt;/sub&gt;+NO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>0.966 (0.95–0.98)</td>
<td>&lt;0.01</td>
<td>0.789 (0.70–0.90)</td>
<td>&lt;0.01</td>
<td>1.068 (1.05–1.08)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Dust days</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>1.140 (1.07–1.21)</td>
<td>&lt;0.01</td>
<td>0.970 (0.95–0.99)</td>
<td>&lt;0.01</td>
<td>1.220 (1.13–1.32)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>+SO&lt;sub&gt;2&lt;/sub&gt;+NO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>1.084 (1.01–1.16)</td>
<td>0.018</td>
<td>0.947 (0.93–0.97)</td>
<td>&lt;0.01</td>
<td>1.150 (1.07–1.24)</td>
<td>&lt;0.01</td>
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</tbody>
</table>
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1. The effects of air pollutants were obviously different on non-dust days and dust days.

2. Air pollution has different lag effects on respiratory diseases.

3. The effect of NO2 on ER visits is greater for total females and adults than other groups. But age and sex stratified analysis show that PM10 at in elderly females, NO2 in adult males elderly, and SO2 in elderly males were significantly greater than other groups.

4. The stronger effects of air pollution in spring might be also attributed to the special valley basin of Lanzhou.