Acute Particulate Matter Exposure and Suicide in North East Asia: A Systematic Review

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Background

Exposure. Particulate matter (PM) is a form of air pollution that is comprised of a mixture of solid particles and liquid droplets. PM can be both human-caused and natural. PM10 and PM2.5 are PM that are 10 microns and 2.5 microns in aerodynamic diameter across or smaller, respectively. PM2.5 is small enough to enter the bloodstream of a human after inhalation.

Particulate Matter and North East Asia. 76% of population living in areas that exceed the World Health Organization’s PM10 first interim target Air Quality Guideline annual average of 35 µg/m³ live in North East Asia (Image: Dalhousie University).

Outcome. Suicide is a complex issue, with suicidal behavior hypothesized to be a result of interactions between individual psychological, sociological, and environmental factors. As seen in the figure below, the suicide rates in this region are typically higher than the global average.

Objective

The objective was to assess whether there is increased risk of suicide completions when persons in North East Asia are exposed to acute PM concentrations in the ambient air.

Methods

I conducted a systematic literature review regarding acute particulate matter exposure and subsequent suicide deaths in North East Asia. I searched articles published up to October 31, 2018, and included original studies that measured concentrations of particulate matter that was ten microns across or smaller, measured suicidal deaths, and were conducted in North East Asia. I evaluated the individual risk of bias for each study, as well as risk of bias across studies, quality of the evidence, and strength of the evidence according to the Navigation Guide systematic review methodology.

Population. Residents of the countries included in North East Asia which are China, Japan, Mongolia, South Korea, and Taiwan.

Exposure. Acute concentrations of PM10. Acutely high concentrations include periods of at least one interquartile (IQR) increase in ambient concentration.

Comparator. The comparator is the same region during times when there are non-elevated concentrations of PM10.

Outcome. Suicide completions are defined in the International Classification of Diseases (ICD) as intentional self-harm mortality, which is purposely self-inflicted poisoning or injury suicide.

Data Sources. I searched the databases Scopus, PubMed, and Proquest using the search terms. I did not limit my search by language or initial publication date. I did my initial search on September 25, 2018 and updated my search on October 31, 2018, to identify any new studies. I also hand-searched references of included studies, and review papers on the topic of air pollution and suicide.

Results

Rating the Quality of Evidence

<table>
<thead>
<tr>
<th>Category</th>
<th>Downgrades</th>
<th>Upgrades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of Bias</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Indirectness</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Inconsistency</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Imprecision</td>
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<td>0</td>
</tr>
<tr>
<td>Publication Bias</td>
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</tr>
<tr>
<td>Overall Quality of Evidence</td>
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<td>Moderate</td>
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</table>

Rating the Strength of Evidence

<table>
<thead>
<tr>
<th>Direction of the Effect Estimate</th>
<th>General null or positive association for dose-response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in Effect Estimates</td>
<td>Some significant findings were found for dose-response</td>
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<tr>
<td>Other Attributes</td>
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<tr>
<td>Overall Strength of Evidence</td>
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</tr>
</tbody>
</table>

Conclusions

I concluded that there was limited evidence to suggest that acute exposure to ambient particulate matter was associated with increased suicide. Evidence could be improved in the future by more carefully assessing exposure, and controlling for chronic disease confounding.

Papers Reviewed


Lin GZ, Li L, Song YF, Zhou YX, Shen SQ, Ou CQ. 2016. The impact of ambient air pollution on suicide mortality: a case-crossover study in Guangzhou China.


Yang AC, Tsai SJ, Huang NE. 2011. Decomposing the association of completed suicide with air pollution, weather, and unemployment data at different timescale.

Poster References


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