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The Effects of Exposure to Air Pollution on Obesity and Obesity Related Anthropometric Measures: A Systematic Review and Meta-Analysis

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Extended Abstract

Background:

The association of air pollution with body fat distribution has been studied observationally, but results have been inconclusive. The present study sought to determine the impact of ambient air pollutants on obesity and the most frequently used anthropometric measurements related to obesity.

Methods:

We searched the following databases: OVID Medline, Embase, PubMed, Web of Science, Latin American and Caribbean health sciences literature and grey literature from inception until October 30, 2023, and we updated the search on January 23, 2024, using the comprehensive search strategy. Two independent reviewers assessed the eligibility of articles and extracted the data. A meta-analysis was conducted for all outcomes with two or more studies, and Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria were used to assess the certainty of evidence.

Results:

We analyzed 35 studies (24 cross-sectional and 11 prospective cohort), of which 22 were from a middle-income country (China), and 13 from high-income countries. The meta-analysis revealed that a 10 $\mu g/m^3$ increase in $PM_{2.5}$ and a 10-ppb increase in NO_2 and O_3 were associated with 0.77, 1.40 and 0.39 kg/m^2 increase in body mass index (BMI), respectively. Moreover, $PM_{2.5}$ (per 10 $\mu g/m^3$), and NO_2 (per 10 ppb) were associated with 1.17 and 18.51 cm increase in waist circumference (WC) respectively. $PM_{2.5}$ (per 10 $\mu g/m^3$), NO_2, O_3, and SO_2 (per 10 ppb) exposure were associated with higher odds of general obesity by 13%, 39%, 13% and 24% respectively. Furthermore, $PM_{2.5}$ (per 10 $\mu g/m^3$) and NO_2 (per 10 ppb) were also associated with increased odds of abdominal obesity by 17% and 64% respectively. In prospective cohort studies, $PM_{2.5}$ (per 10 $\mu g/m^3$) and NO_2 (per 10 ppb) were associated with 0.22 and 0.08 kg/m^2 increase in BMI, while $PM_{2.5}$ (per 10 $\mu g/m^3$), NO_2 and O_3, (per 10 ppb) were associated with 0.07, 1.15, and 1.54 cm increase in WC from baseline, respectively. $PM_{2.5}$ increased general obesity risk by 8%, but NO_2 and $PM_{2.5}$ were not associated with abdominal obesity [HR, 1.02 (95% CI, 0.94, 1.11) and HR, 0.96 (95% CI, 0.92 to 1.01) respectively].

Conclusion

Higher $PM_{2.5}$, NO_2, O_3 and SO_2 levels were positively correlated with increased BMI, WC, and other anthropometric parameters, and increased risk of overweight and obesity.