Arch Bronconeumol. 2020;56(9):543–544

Sociedad Española de Neumología y Cirugía Torácica SEPAR

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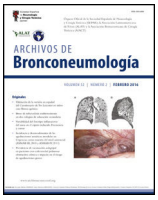

Editorial

Is the Impact of Air Pollution on Mortality from Respiratory or Circulatory Causes Greater in Spain?☆

¿Es mayor en España el impacto de la contaminación atmosférica química sobre la mortalidad atribuible por causas respiratorias o por causas circulatorias?

Air pollution accounted for more than 7 million premature deaths worldwide in 2012.[1] The largest published study of the burden of morbidity and mortality attributable to air pollution[2] found that it is associated with 36% of lung cancer deaths, 35% of deaths from chronic obstructive pulmonary disease, 34% of deaths from stroke, and 27% of deaths from heart disease, suggesting that the overall impact of pollution is greater on the respiratory system than on the cardiovascular system. Is this also true in Spain?

In this paper we will only discuss the impact of chemical air pollution on mortality to distinguish it from the effect of noise pollution on mortality that has been the subject of another editorial in this journal.[3]

A recent study in Spain analyzing mortality due to natural causes attributable to the short-term effects of chemical air pollution (classified under the ICD-10 headings: A00-R99, *excluding injuries and poisonings*) suggests that it is associated with 9267 deaths/year (95% CI: 4417–14,548).[4] But what proportions are attributable specifically to respiratory (ICD-10 J00-J99) and to circulatory (ICD-10 I00-I99) causes? The answer is not as clear, and depends on the pollutant analyzed and the health impact indicator in question.

For particulate matter measuring less than 10 μs in diameter (PM_{10}), the random effects meta-analysis estimated the relative risk (RR) for short-term mortality from respiratory causes for Spain as a whole, calculated from the RR values obtained for 46 Spanish provinces in the period 2000–2009. For increments of 10 $\mu g/m^3$ in the concentration of PM_{10},[5] the RR is 1.026 (95% CI: 1.019–1.033), whereas for circulatory causes it is lower, at RR 1.009 (95% CI: 1.006–1.012).

Taking into account the mean PM_{10} concentrations analyzed during the study period and the recorded daily mortality, the annual short-term mortality from respiratory causes attributable to this pollutant is 650 deaths/year (95% CI: 358–1025), whereas for circulatory causes it is lower, at 556 deaths/year (95% CI: 116–1012).

In the case of nitrogen dioxide (NO_2), according to another study carried out to calculate the impact of this pollutant on short-term daily mortality in the Spanish provinces as a whole,[6] the RR for respiratory causes, for increments of 10 $\mu g/m^3$ is 1028 (95% CI: 1020–1036) and 1016 (95% CI: 1012–1021) for circulatory causes. In other words, the RR is also higher for respiratory causes than for circulatory causes. However, taking into account the daily mortality from these specific causes and the daily mean concentrations of NO_2 by provinces, short-term annual mortality attributable to NO_2 would be 1030 deaths/year (95% CI: 466–1585) from respiratory causes, and mortality from circulatory causes would be almost twice that, at 1977 deaths/year (95% CI: 828–3197).

Tropospheric ozone (O_3) is a secondary chemical pollutant, meaning that it is not emitted into the atmosphere from any source. Instead it is formed from other pollutants in the air called precursors that are usually present in urban atmospheres. In the case of this compound, its functional relationship with daily mortality is not linear, as observed for the concentrations of PM_{10} and NO_2, but quadratic,[7] i.e., there is a threshold value for each area analyzed (city) after which ozone starts to have an impact on health. Therefore, this variable must be parameterized in order to limit the statistical analysis to concentrations with an impact on health. This process results in an RR of 1.089 (95% CI: 1058–1120) for respiratory causes and of 1.025 (95% CI: 1.018–1.033) for circulatory causes for concentrations of 10 $\mu g/m^3$ ozone above the health impact threshold for all Spanish provinces analyzed. In other words, the RR is higher for respiratory causes than for circulatory causes. However, the annual mortality attributable to ozone would be 126 deaths/year (95% CI: 54–194) for respiratory causes and 167 deaths/year (95% CI: 39–292) for circulatory causes.

For the 3 pollutants analyzed, RR is higher for respiratory causes than for circulatory causes, indicating an increased risk of short-term mortality from these causes. However, daily mortality from circulatory causes (311 deaths/day) is higher than mortality from respiratory causes (106 deaths/day) in Spain between 2000 and 2009 in the 46 provincial capitals included in the study, so mortality attributable to air pollution is greater for circulatory than for respiratory causes. Thus, the short-term annual mortality attributable to air pollution for Spain as a result of PM_{10}, NO_2 and O_3 air pollutants would be 1806 deaths/year (95% CI: 878–2804) for respiratory causes and 2700 deaths/year (95% CI: 983–4501) for circulatory causes.

☆ Please cite this article as: Linares C, Sánchez-Martínez G, Díaz J. ¿Es mayor en España el impacto de la contaminación atmosférica química sobre la mortalidad atribuible por causas respiratorias o por causas circulatorias? Arch Bronconeumol. 2020;56:543–544.

To put these figures into context, we should point out that the annual mortality attributable to smoking in Spain between 2010 and 2014 was 51,870 deaths/year,[8] i.e. short-term mortality attributable to air pollution is almost one fifth of that attributable to smoking and 3% of the total mortality that occurred during that period in Spain.[9] We should also remember that the values reported in that study only take into account short-term mortality. If other long-term diseases were included, mortality attributable to pollution would be around 38,600 deaths/year in 2015,[10] a figure of the same order of magnitude as that attributed to smoking.

To summarize, chemical air pollution is a major public health risk factor that significantly increases premature mortality from respiratory causes, among others. It is therefore essential to insist on the need to reduce concentrations of atmospheric pollutants by implementing evidence-based policies, particularly in the case of compounds such as particulate matter, for which no safe threshold has been determined.[11] Similarly, a Surveillance Plan to monitor the effects of chemical air pollution on morbidity and mortality throughout Spain must urgently be set up in order to adequately monitor the health impacts on the population, especially among the most vulnerable groups (elderly, children, and pregnant women), in whom the effects are especially harmful, often precipitating premature death or increasing the burden of disease, leading to the loss of years of potentially healthy life.

References

1. WHO, Available from. https://www.who.int/mediacentre/news/releases/2014/air-pollution/es/, 2014.
2. Landrigan PJ, Fuller R, Acosta NJR, Adeyi O, Arnold R, Basu N, et al. The Lancet Commission on pollution and health. Lancet. 2017;391:10119.
3. Linares C, Díaz J. Ruido de tráfico y enfermedades respiratorias: ¿Hay evidencias? Arch Bronconeumol. 2019;55:511–2.
4. Díaz J, Linares C. Impacto de la contaminación atmosférica sobre la mortalidad diaria a corto plazo en España. Rev Salud Ambient. 2018;18:120–36.
5. Ortiz C, Linares C, Carmona R, Díaz J. Evaluation of short-term mortality attributable to particulate matter pollution in Spain. Environ Pol. 2017;224:541–51.
6. Linares C, Falcón I, Ortiz C, Díaz J. An approach estimating the short-term effect of NO2 on daily mortality in Spanish cities. Environ Int. 2018;116:18–28.
7. Díaz J, Ortiz C, Falcón I, Linares C. Short-term effect of tropospheric ozone on daily mortality in Spain. Atm Environ. 2018;187:107–16.
8. Ministerio de Sanidad, Servicios Sociales e Igualdad. Muertes atribuibles al consumo de tabaco en España 2000-2014. Ministerio de Sanidad, Servicios Sociales e Igualdad; 2016.
9. INE. Instituto Nacional de Estadística. Available from: https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=EstadisticaC&cid=1254736176780&menu=ultiDatos&idp=1254735573175.
10. EEA. Air quality in Europe-2018 Report. Luxembourg: European Environmental Agency; 2018.
11. OMS. Calidad del aire y salud. Nota descriptiva. 2018 [Accessed 2 May 2018]. Available from: https://www.who.int/es/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health.

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