Risk of dying in hospital from respiratory causes is higher in the summer than in the winter, study finds

November 7 2023

Credit: Pixabay/CC0 Public Domain

Global warming caused by climate change could exacerbate the burden of inpatient mortality from respiratory diseases during the warm season.

This is the main conclusion of a study led by the Barcelona Institute for Global Health (ISGlobal) and published in *The Lancet Regional Health—Europe*. The results could help health facilities adapt to climate change.

The research team analyzed the association between ambient temperature and in-hospital mortality from respiratory diseases in the provinces of Madrid and Barcelona between 2006 and 2019. In both locations, the number of hospital admissions (including those resulting in death) was higher in the cold season and lower in the warm season, with a peak in the month of January and a minimum in the month of August.

In contrast to hospital admissions, which were higher during the cold season, the maximum incidence of inpatient mortality occurred during the summer and was strongly associated with high temperatures.

To calculate the association between ambient temperature and hospital mortality, the team used data on daily hospital admissions, weather (temperature and relative humidity) and air pollutants (O_3, $PM_{2,5}$, PM_{10} and NO_2).

Although it is well established that daily exposure to heat and cold is associated with a higher risk of hospital admission from a range of respiratory diseases such as pneumonia, chronic obstructive pulmonary disease (COPD) and asthma, no study had focused on the proportion of hospital admissions that result in death, and therefore, the more severe cases.

The link between high temperatures and mortality

In terms of attributable burden, summer temperatures accounted for 16% and 22.1% of overall fatal hospitalizations from respiratory diseases in Madrid and Barcelona, respectively. The heat effect was

immediate, with most of the impact occurring within the first three days of exposure to high temperatures.

"This suggests that the increase in acute respiratory outcomes during heat is more related to the aggravation of chronic and infectious respiratory diseases than to the spread of new respiratory infections, which usually take several days to cause symptoms," says Hicham Achebak, first author of the study and researcher at Inserm and ISGlobal, who holds a Marie Skłodowska-Curie Postdoctoral Fellowship from the European Commission.

The results of the study showed an effect of heat on acute bronchitis and bronchiolitis, pneumonia and respiratory failure. Neither relative humidity nor air pollutants played a statistically significant role in the association of heat with mortality in patients admitted for respiratory disease. The research also showed that women were more vulnerable to heat than men.

"This is most likely due to specific physiological differences in thermoregulation. Women have a higher temperature threshold above which sweating mechanisms are activated, and a lower sweat output than men, which results in less evaporative heat loss, and therefore greater susceptibility to the effects of heat," explains Joan Ballester, ISGlobal researcher and last author of the study.

Adapting to climate change in hospital centers

The study shows that high temperatures contributed to an increase in the risk of fatal hospital admissions, especially in Barcelona, whereas low temperatures were not associated with this variable. According to the research team, this might have to do with the fact that health services are increasingly prepared to deal with winter peaks in respiratory diseases.

In this sense, the findings have important implications for health adaptation policies to climate change, and for projections of the impact of climate change on human health.

"Unless effective adaptation measures are taken in hospital facilities, climate warming could exacerbate the burden of inpatient mortality from respiratory diseases during the warm season," says Achebak.

More information: Ambient temperature and seasonal variation in inpatient mortality from respiratory diseases: a retrospective observational study, *The Lancet Regional Health—Europe* (2023). DOI: 10.1016/j.lanepe.2023.100757

Provided by Barcelona Institute for Global Health