Publication

Non-optimal apparent temperature and cardiovascular mortality: the association in Puducherry, India between 2011 and 2020

BACKGROUND: Cardiovascular diseases (CVDs), the leading cause of death worldwide, are sensitive to temperature. In light of the reported climate change trends, it is important to understand the burden of CVDs attributable to temperature, both hot and cold. The association between CVDs and temperature is region-specific, with relatively few studies focusing on low-and middle-income countries. This study investigates this association in Puducherry, a district in southern India lying on the Bay of Bengal, for the first time. METHODS: Using in-hospital CVD mortality data and climate data from the Indian Meteorological Department, we analyzed the association between apparent temperature (T(app)) and in-hospital CVD mortalities in Puducherry between 2011 and 2020. We used a case-crossover model with a binomial likelihood distribution combined with a distributed lag non-linear model to capture the delayed and non-linear trends over a 21-day lag period to identify the optimal temperature range for Puducherry. The results are expressed as the fraction of CVD mortalities attributable to heat and cold, defined relative to the optimal temperature. We also performed stratified analyses to explore the associations between T(app) and age-and-sex, grouped and considered together, and different types of CVDs. Sensitivity analyses were performed, including using a quasi-Poisson time-series approach. RESULTS: We found that the optimal temperature range for Puducherry is between 30 degrees C and 36 degrees C with respect to CVDs. Both cold and hot non-optimal T(app) were associated with an increased risk of overall in-hospital CVD mortalities, resulting in a U-shaped association curve. Cumulatively, up to 17% of the CVD deaths could be attributable to non-optimal temperatures, with a slightly higher burden attributable to heat (9.1%) than cold (8.3%). We also found that males were more vulnerable to colder temperature; females above 60 years were more vulnerable to heat while females below 60 years were affected by both heat and cold. Mortality with cerebrovascular accidents was associated more with heat compared to cold, while ischemic heart diseases did not seem to be affected by temperature. CONCLUSION: Both heat and cold contribute to the burden of CVDs attributable to non-optimal temperatures in the tropical Puducherry. Our study also identified the age-and-sex and CVD type differences in temperature attributable CVD mortalities. Further studies from India could identify regional associations, inform

our understanding of the health implications of climate change in India and enhance the development of regional and contextual climate-health action-plans.

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