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Mini Review

A Short Note on Intense Temperatures Impact on Consequence Cardiovascular Events

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Abstract

Objective: In China, there is a lack of evidence regarding the effects of extreme temperatures on cause-specific cardiovascular mortality. Methods: Between 2007 and 2009, we gathered information from Beijing and Shanghai, China, including daily mortality rates for cardiovascular, cerebrovascular, ischemic, and hypertensive diseases, air pollution levels, and weather conditions. To investigate the effects of extremely high and low ambient temperatures on cause-specific cardiovascular mortality, we employed a distributed lag non-linear Poisson regression model.

Results: Beijing had stronger effects of cold and heat for all cause-specific cardiovascular mortality than Shanghai. The strongest cold effects on cause-specific cardiovascular mortality occurred between lags 0 and 27, while the strongest hot effects occurred between lags 0 and 14. In the two cities, the types of deaths affected by extremely low and high temperatures varied. In Beijing, hypertension was especially susceptible to extremely high and low temperatures; whereas individuals with ischemic heart disease exhibited the greatest relative risk in Shanghai (RRs = 1.16, 95 percent CI: 1.34) to a very low temperature.

Conclusion: In Beijing, extremely low and high temperatures were particularly dangerous for people with hypertension. In Shanghai, people with ischemic heart disease were more susceptible to extremely cold days.

Keywords: Extreme temperatures, cardiovascular disease, cerebrovascular disease, Ischemic heart disease, Hypertension

INTRODUCTION

In general, there was a U, J, or V-shaped relationship between temperature and mortality, with mortality rising at both high and low temperatures (Anderson B et al., 2015). It has been demonstrated that the adverse effects of extremely high and low temperatures can vary greatly based on the population's vulnerability and the type of climate. The relationship between ambient temperature and cardiovascular disease has been the subject of numerous studies. Some of them used meta-analysis to combine the effects of temperature on single cardiovascular mortality in multiple cities, such as stroke or ischemic heart disease. Others examined the impact of temperature on cardiorespiratory disease deaths in a single city. However, a person may be more susceptible to extreme temperatures if they have a medical condition. In addition, it is still unclear whether ambient temperature and cause-specific cardiovascular mortality are linked in different regions. Extreme temperature-related cardiovascular mortality has only been the subject of a small number of studies. Additionally, their outcomes vary. Additionally, even within the same nation, regional climatic types varied in how extreme temperatures affected people. Therefore, it is necessary to investigate the relationships between extreme temperatures and cause-specific cardiovascular mortality in two different Chinese cities. The results of such a study could be crucial in determining who is at risk for particular diseases. Extreme temperatures are likely to rise as a result of climate change. Extreme temperatures have been linked to high rates of morbidity and mortality in previous epidemiological studies. People whose health is already compromised are particularly vulnerable to the negative effects of extreme temperatures. In many nations, cardiovascular diseases, particularly ischemic heart disease and cerebrovascular disease, have remained the leading causes of death over the past decade and contribute significantly to the overall burden of disease (Choquet A et al., 2018)(Barnes J et al., 2013).

MATERIALS AND METHODS

For the two cities, the China Meteorological Data Sharing Service System provided daily meteorological data from 2007 to 2009, including relative humidity (RH), wind speed, maximum temperature, minimum temperature, and mean temperature (MT). In each city, the urban district serves as the location of the meteorological stations. For the same time period, data on daily ambient air quality concentrations were obtained from the local Environmental Monitoring Centre (Clayton S et al., 2016) (Dunn G et al., 2017). Each city had a number of these pollution monitoring stations, with 12 in Beijing and 17 in Shanghai. Particulate matter with a median aerodynamic diameter of less than 10 microns (PM10), sulphur dioxide (SO2), and nitrogen dioxide (NO2) concentrations were averaged daily at monitoring stations in each city.

We defined the extremely low and extremely high temperatures of the first and 99th percentiles of two cities as, respectively. We calculated the relative risks for cause-specific cardiovascular mortality at the 1st percentile of temperature compared to the 10th percentile of temperature, which we referred to as the "cold effect," and at the 99th percentile of temperature compared to the 90th percentile of temperature, which we referred to as the "hot effect," in order to quantify the effects of extreme temperatures. We calculated the lag effects at lags of 0, 0–7, 0–14, and 0–27 to estimate the cumulative effects of extreme temperatures. We divided the season into cold (November–March) and warm (April–October) periods to examine the seasonal effects of extreme temperatures. From November to March every year, Beijing's central heating system is operational. However, during this time, Shanghai is one of the cities without central heating. We also looked at how extreme low and high temperatures affected people under 65.

DISCUSSION

Mean temperature's three-dimensional exposure-response surfaces on cardiovascular mortality by cause along lag day (Eigenbrode SD et al., 2007). In both cities, the estimated effects of temperatures on cause-specific cardiovascular mortality were generally nonlinear, with higher mortality rates on days when temperatures were both high and low. Both the cold and hot effects on CVD mortality in the two cities reached their maximum at lag 0 and decreased over time. For CBD morality, Beijing's cold effects increased from lag 0 to lag 5 days, reaching their peak on lag 5, while Shanghai's cold effects increased from lag 0 to lag 10 days, reaching their peak on lag 10. In Beijing, both the hot and cold effects on IHD mortality decreased along with the lag days; whereas Shanghai's cold effects decreased from lag 0 to lag 10 and then significantly increased after lag 10, After lag 20, both the cold and the hot effects on HPD mortality increased in the two cities. In general, the effects of heat appear right away and last for at least ten days, whereas the effects of cold last longer. In contrast to other cardiovascular diseases, the cold effects on HPD mortality in Beijing and IHD mortality in Shanghai lasted longer (Fiksel J et al., 2014) (Glika DC et al., 2007).

Mean temperature's cumulative relative risk of cause-specific cardiovascular mortality over the 27 lag days. It demonstrated that the relative risks of cause-specific cardiovascular mortality were increased by both the high and low temperatures in Beijing, but only by the low temperatures in Shanghai. It is important to note that HPD mortality in Shanghai did not appear to be affected by low temperatures. In general, a higher risk of cause-specific cardiovascular mortality was found at low temperatures than at high temperatures. In Beijing and Shanghai, the ideal temperatures for death were 25 °C and 28 °C, respectively (Hoover E et al., 2015).

The cumulative effects of the cold on cause-specific cardiovascular mortality in the two cities at lag 0, lag 0–7, lag 0–14, and lag 0–27 days. At lags of 0–27 days, the cumulative effects of the cold on cause-specific cardiovascular mortality were greatest. At lags 0–27 in Beijing, the cumulative cold effects on HPD mortality were greatest (RRs = 1.64, 95% CI: 1.06, 2.55) for the mortality from cardiovascular causes; whereas, in Shanghai, individuals with ischemic heart disease were more susceptible to the extremely low temperatures than those without the condition. Along lag days, Beijing's hot and cold effects on cause-specific cardiovascular mortality were stronger than Shanghai's. All cause-specific cardiovascular diseases in the two cities had cold effects at lags 0–27 that were greater than hot effects.

When using three to six degrees of freedom per year for time in Beijing and Shanghai, China, the estimated relationship between temperature and cardiovascular disease mortality remained constant. Similar results were obtained when we fitted a time lag of 28-30 days, and there was no change there.

Additionally, we estimated the relative risks of extremely low temperature (first percentile of temperature) and extremely high temperature (99th percentile of temperature) on cause-specific cardiovascular mortality, which were also similar to the initial estimates. We also changed the cold and hot thresholds by using the 25th percentile of temperature as the cold threshold and the 75th percentile of temperature as the hot threshold. To examine the effects of temperature, we also used the apparent temperature as the meteorological indicator for the two cities. The results were comparable to the initial estimates. After removing the effects of air pollution from the model, the effects of temperature on cause-specific cardiovascular mortality in the two cities were comparable to the initial findings (Maxwell K et al., 2014).

In Beijing and Shanghai, China, his study looked at how extreme temperatures affected cause-specific cardiovascular mortality. The optimal temperature was 25 °C in Beijing and 28 °C in Shanghai, where the associations between temperature and cause-specific cardiovascular mortality were U-shaped. We found that Beijing's cold and heat effects were stronger than Shanghai's. We observed the strongest cold and hot effects for HPD mortality among Beijing's cause-specific cardiovascular mortality; whereas individuals with IHD were more susceptible to the extremely low temperatures in Shanghai than those without cardiovascular disease. In both cities, the low temperature generally had a greater impact on cause-specific cardiovascular mortality.

The U- or J-shaped associations between temperature and mortality have been the subject of numerous previous studies. In this study, similar results were observed. Beijing presented the "U" shape, which posed greater risks relative to temperature both at low and high levels. In Shanghai, the "J"-shaped relationships between mean temperature and cause-specific cardiovascular mortality were more pronounced at low temperatures. In comparison to Shanghai, where the optimal temperature for cause-specific cardiovascular mortality was 28 °C, Beijing's was 25 °C. Gasparrini and others found that the minimum mortality temperature was close to the 83rd (25.6 °C) percentile of the temperature in Beijing, China, which was consistent with our findings when they looked at the associations between temperature and mortality for 384 locations around the world. In a similar vein, Zhang et al. stated that the threshold temperature in Shanghai, China, was 26.9 °C. The optimal temperature in communities with colder climates is lower than in communities with warmer climates, as evidenced by this finding.

CONCLUSION

The fact that we were able to simultaneously examine the effects of extreme temperatures on CVD, CBD, IHD, and HPD in Chinese cities of various climates is one of our study's main strengths. Because they are more accustomed to higher temperatures, the findings of our study suggest that people who live in a region with a temperate climate, such as Beijing, may experience greater hot effects than people who live in a region with a subtropical climate, such as Shanghai. Additionally, the present analyses' findings suggest that we ought to pay attention to individuals with HPD during extremely hot summer months. We should also pay more attention to people with HPD in Beijing and IHD in Shanghai during the extremely cold winter months.

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CONFLICT OF INTEREST

None

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