Libyan International Medical University
Faculty of Basic Medical Science

Temperature, Myocardial Infarction, and Mortality: Effect Modification by Individual and Area-Level Characteristics.

Submitted by: fatma.A. alsahly , third year student, faculty of basic medical science, Libyan International Medical University.

Student number: - 1160

Supervisor: Ghanem touati

Date of submission: - 30\6/2018

Summary (Abstract):-

While several studies have examined associations between temperature and cardiovascular-disease-related mortality, fewer have investigated the association between temperature and the development of acute myocardial infarction (MI). Moreover, little is known about who is most susceptible to the effects of temperature.

We analyzed data from the Worcester Heart Attack Study, a community-wide investigation of acute MI in residents of the Worcester (MA) metropolitan area. We used a case-crossover approach to examine the association of apparent temperature with acute MI occurrence and with all-cause in-hospital and post-discharge mortality. We examined effect modification by sociodemographic characteristics, medical history, clinical complications, and physical environment.

A decrease in an interquartile range (IQR) in apparent temperature was associated with an increased risk of acute MI on the same day (hazard ratio=1.15 [95% confidence interval= 1.01–1.31]). Extreme cold during the 2 days prior was associated with an increased risk of acute MI (1.36 [1.07–1.74]). Extreme heat during the two days prior was also associated with an increased risk of mortality (1.44 [1.06–1.96]). Persons living in areas with greater poverty were more susceptible to heat.

Introduction:-

Human activity is expected to result in a global increase in temperature, as well as differential changes by season and location. Additionally, the frequency of extreme temperature episodes is projected to rise. Many studies have linked increased mortality to changes in or extremes of temperature.

While the association between temperature and cardiovascular mortality is important, fewer studies have investigated the association between the incidence of cardiovascular disease (CVD) and ambient temperature. Many of the studies that have examined the association between temperature and myocardial infarction (MI) have used MI mortality as an outcome rather than non-fatal events. Moreover, few of these studies have adjusted for potentially important confounders, including air pollution.

The Interagency Working Group on Climate Change and Health recently highlighted vulnerability to the human health effects of climate change as a research priority. While there is some evidence that sociodemographic characteristics, including advanced age, race, and lower educational attainment, can increase the risk of mortality due to temperature, little is known about susceptibility in the relationship between temperature and occurrence of MI.

We examined the association between temperature and occurrence of acute MI, as well as subsequent mortality. In addition to the main effects of temperature, we examined effect modification of the association between temperature and acute MI, as well as subsequent mortality, by individual and area-level characteristics. [1,2]

Discussion:-

We found that extreme cold and decreases in apparent temperature increased the risk of acute MI. We did not find any effects of heat on the risk of acute MI in the population as a whole, although certain susceptible groups had an increased risk of acute MI with heat. We also found that extreme heat was associated with an increased risk of dying in people with a prior acute MI.

The published literature on temperature and the development of MI is not as comprehensive as that on temperature and mortality. Findings from time-series studies have been inconsistent, with some reporting effects for cold, some for heat, and some for both. These inconsistencies may be due to a number of factors including methodology and study-population differences. Few studies adjusted for air pollution, which can vary with season and temperature and has been associated with the development of acute coronary disease. Further, a number of studies used MI-related mortality, which does not capture non-fatal events of MI and also may have poor specificity when the diagnosis is assumed. A recent systematic review and meta-analysis on ambient temperature and cardiorespiratory morbidity found no effect of increasing temperature on cardiovascular morbidity (relative risk=0.999 [95% posterior interval: 0.982–1.016] per 1°C increase in temperature). This is consistent with our finding of no effect of heat on acute MI in the overall study population. This same meta-analysis concluded that there were too few studies on effects of cold temperatures to draw conclusions, although a number of studies that examined validated MI as an outcome found an association between cold weather and MI. A study of hospital admissions in England and Wales found that a 1° C decrease in daily mean temperature was associated with a 2% increase in risk of MI over the current and following 28 days. Another population-based registry in Augsburg, Germany found that a 10°C decrease in 5-day average temperature was associated with a relative risk of MI of 1.10 (95% confidence interval= 1.04–1.15), similar in magnitude to our results. These studies adjusted for both air pollution and level of influenza and also validated most cases of MI.

Both high and low temperatures have been associated with all-cause mortality in a wide range of populations. While some studies have found evidence for only a heat effect,[2] a comprehensive analysis of the effects of heat and cold on mortality found heat-related mortality for shorter lags and cold-related mortality for longer lags. Studies in the U.S. have found evidence for an approximately 2% increase in mortality associated with a 10°F increase in apparent temperature. Additionally, the effects of temperature have been found to vary by latitude, with northern cities in the US, such as Boston, experiencing more of a rise in mortality risk at higher temperatures than southern US cities. Our analysis of short-term effects, as well as the location of our study, may explain why we observed the strongest associations with mortality for heat and saw trends toward associations for cold in longer lags. A number of mechanisms to explain how temperature affects morbidity and mortality have been proposed, including increases in blood pressure and increases in fibrinogen on cold days, as well as increases in serum LDL levels with increasing ambient temperatures. These different mechanisms may partially explain the differences in results in morbidity and mortality.

Conclusions:- Exposure to cold increased the risk of acute MI, and exposure to heat increased the risk of dying after an acute MI. Local area vulnerability should be accounted for as cities prepare to adapt to weather fluctuations as a result of climate change.[3]

Reference:

1- Meehl GA, Tebaldi C. More intense, more frequent, and longer lasting heat waves in the 21st century. Science. 2004;305:994–997.

2- Curriero FC, Heiner KS, Samet JM, Zeger SL, Strug L, Patz JA. Temperature and mortality in 11 cities of the eastern United States. Am J Epidemiol. 2002;155:80–7.

3- Bhaskaran K, Hajat S, Haines A, Herrett E, Wilkinson P, Smeeth L. Effects of ambient temperature on the incidence of myocardial infarction. Heart. 2009;95:1760–1769.