# Weather-related pain

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**Weather-related pain—also known as meteorological pain or climate-induced pain—is a phenomenon reported by individuals with conditions such as arthritis, bone injuries, or neuromuscular disorders. These individuals claim to experience increased pain, especially during changes in barometric pressure, humidity, or other weather patterns.**

**Symptoms may intensify with shifts in humidity or the onset of precipitation. Other conditions commonly associated with this phenomenon include osteoporosis, fibromyalgia, carpal tunnel syndrome, and post-explosive trauma, where microfractures in the skeletal system may trigger similar pain responses.**

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Historical Background
A hypothetical link between weather changes and pain has been documented since classical antiquity. Around 400 BCE, Hippocrates may have been the first to suggest a connection between atmospheric conditions and health. Popular expressions such as “aches and pains, rain is coming” or “ill health from wicked winds” reflect a long-standing cultural belief in this effect.

In 1929, Rentshler published in the Journal of the American Medical Association that barometric pressure changes could be harmful to arthritis patients. The Mayo Clinic has confirmed that migraines may be triggered by certain weather changes, and the UK’s NHS states that such changes may provoke chemical and electrical shifts in the brain.

Despite these claims, scientific consensus remains elusive. Some researchers argue that the perceived link is largely due to confirmation bias, with the notable exception of headaches and migraines, which show more consistent correlations.

Meteorological dependence is not officially recognized by the medical community as a disease and is not included in the list of the International Classification of Diseases adopted by the World Health Organization, but some doctors recognize the possible impact of weather on human well-being.

Experts suggest that the main cause of pain in weather-dependent people is associated with a sharp change in air temperature, changes in atmospheric pressure and geomagnetic activity, as well as the level of humidity of the environment, which can cause an imbalance of chemicals (for example, serotonin), as well as affect the cardiovascular system of a person, including changing blood flow to the brain, causing headaches, migraines, apathy, and other painful sensations[1][2].

Doctor of Medical Sciences, Professor of the Department of Neurology of Perm State Medical University Yulia Karakulova is convinced that:

Meteorological dependence is an excessive human response to changes in environmental conditions. This is due to the work of the autonomic nervous system — it provides self-regulation of processes inside the human body and its reaction to what is happening around [3].

## Possible causes of meteorological dependence

A painful reaction is caused by self-regulating processes in the human body, with the help of which its biological systems maintain internal stability, adapting it to optimal conditions for the survival of the body: breathing, blood pressure, pulse, thermoregulation, etc.

Win Chang, MD, ShoulderSphere:

Of course, our body reacts to changes in the environment. Our joints act like "balloons" – they contract in response to increased atmospheric barometric pressure and expand under reduced atmospheric pressure[5]

Weather factors that can affect the body and provoke attacks of meteorological dependence include:

sudden changes in atmospheric pressure;
solar flares or geomagnetic activity;
changes in air temperature and humidity of the environment.

Additional factors that negatively affect the human body and can provoke and increase meteorological dependence are:

stress;
inactive lifestyle;
smoking;
alcohol.

## Symptoms of meteorological dependence

Symptoms of meteorological dependence can manifest themselves and be exacerbated if a person has the following diseases:

Headaches, migraines, dizziness, weakness. They are caused by a deterioration in the circulatory system and oxygen delivery to the brain.
Pain in muscles, joints, places of injury, stretching, fractures. They are caused by adaptation and changes in the body to the environment (in places of fractures, the structure of bone and tissue is changed).
Apathy, negative mood, aggressiveness during weather jumps are most often manifested in people with high receptor sensitivity and neurotic disorders.

Also, painful sensations may occur from the nervous system, cardiovascular, respiratory, gastrointestinal tract, thermoregulation, sweating.

## Meteorological Dependence Studies

Research to support meteorological dependence as a disease

A team of researchers from the University of Manchester and their collaborators conducted a 15-month study involving more than 13,000 people in the UK who suffer from meteodependence. Participants recorded their daily pain intensity in a smartphone app. After that, the GPS locations of their phones will be linked to local weather data.

After analyzing 5.1 million reports of pain, the researchers compared each person's weather on days when there was a significant increase in pain; the weather on days when such an increase in pain was not observed. They found that days with higher humidity, lower pressure, and stronger winds were more likely to be associated with days of severe pain.

Scientists at the Mayo Clinic confirm the existence of seasonal depression (SAD), which is caused by a change in weather in late autumn or early winter, and which occurs on sunnier days in spring and summer.

Australian scientists found that in 200 patients followed for three months, knee pain slightly worsened when the temperature dropped or atmospheric pressure increased.

In March 2023, Meteoagent, an app for meteodependent people, conducted its own study of meteodependent people, during which it found a correlation between sudden changes in weather and the deterioration of respondents' well-being[9].

Other studies

«The Earth's Echo of Solar Storms" is a monograph by Alexander Leonidovich Chizhevsky, a Soviet biophysicist, the founder of heliobiology. In his book, Chizhevsky analyzed a large amount of historical material and found a correlation between the maxima of solar activity and mass cataclysms on Earth. From this, a conclusion was drawn about the influence of the 11-year cycle of solar activity (periodic increase and decrease in the number of sunspots on the Sun) on climatic and social processes on Earth.

Scientific Evaluation

The first medical publication to document weather-related pain appeared in 1887 in the American Journal of the Medical Sciences. It described a case of phantom limb pain that worsened with approaching storms and falling barometric pressure.

Most subsequent studies have focused on arthritis patients. In 1929, Rentshler concluded that warm weather was beneficial and that barometric pressure changes were detrimental to those with arthritis.

Recent studies, such as one published in 2023 by the American Headache Society, found that low barometric pressure, pressure fluctuations, increased humidity, and precipitation were associated with a rise in migraine cases.

Controversy

Challenging the 1929 barometric pressure claim, atmospheric scientist Dennis Driscoll stated in a 2016 article titled “Do Your Aches, Pains Predict Rain?” that “people need to realize that pressure changes associated with storms are very small.” He noted that the pressure change from a storm is roughly equivalent to what one experiences when riding an elevator in a tall building—yet there are few reports of arthritis flaring up in elevators.

Furthermore, a 2017 study published in the British Medical Journal analyzed millions of Medicare visits between 2008 and 2012 and found no significant correlation between joint or back pain and rainfall data collected by the National Oceanic and Atmospheric Administration (NOAA).