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METEOROPATHY AND METEOROSENSITIVE PERSONS

METEOROPATIJA I METEOROPATE

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Summary

Introduction. The authors are dealing with the questions often asked by their patients: how weather changes, oscillations in humidity, air pressure and other climate factors affect functioning of the human body. **Meteorology and Biometeorology.** Definitions of meteorology and biometeorology are given, describing some of the most important characteristics, such as the types of disorders and the reasons for their occurrence, frequency, gender and age factors, etc. with particular reference to disorders related to the mental and nervous functions. **Discussion.** The possibilities of prevention, the importance of monitoring biometeorology forecasts and the questionable need for drug use during the seasonal shifts, which cause fatigue, irritability, poor concentration and apathy, hypersensitivity to pain, headache, dizziness, anxiety, head buzzing, etc. are discussed.

Key words: Meteorology; Weather; Acclimatization; Temperature; Risk Factors; Signs and Symptoms; Adaptation, Physiological; Therapeutics

Meteoropathy - History, Concept, Definition and Causes

As part of nature and its product, human beings respond to all the events in their environment, including meteorological factors. Those who cannot adjust to changes experience manifestations and problems that are called meteoropathic. The Ancient Greeks emphasized the interactions between the weather and human health more than 2.500 years ago, pointing to the importance of weather conditions and their impact on the human health. Today, they are generally accepted and are getting more and more attention.

The term meteoropathy comes from the Greek word meteoron - a celestial phenomenon and pathos - disease. Difficulties associated with weather changes, including air temperature, humidity and wind, air pressure, ionization, ultraviolet radiation, atmospheric precipitation and other meteorological factors,

Sažetak

Uvod. Autori daju odgovore na pitanja koja se često postavljaju lekarima u praksi – kako promene vremena kao što su oscilacije u temperaturi, vlažnosti, atmosferskom pritisku i drugim klimatskim činiocima, utiču na funkcije ljudskog organizma. **Meteorologija i biometeorologija.** Definišu se pojmovi meteorologije i biometeorologije, opisuju neke od njihovih važnijih karakteristika kao što su vrste poremećaja i razlozi njihove pojave, učestalost, zastupljenost prema polu, uzrastu i druge, sa posebnim osvrtom na poremećaje u vezi sa mentalnim i nervnim funkcijama. **Diskusija.** Raspravlja se o mogućnostima prevencije, važnosti praćenja biometeoroloških prognoza i upitne potrebe za upotrebom lekova tokom smene godišnjih doba, kada su izraženi: umor, razdražljivost, loša koncentracija i apatija, preosetljivost na bol, glavobolja, vrtoglavica, nervoza, anksioznost, zujanje u glavi i drugo.

Ključne reči: meteorologija; vreme; aklimatizacija; temperatura; faktori rizika; znaci i simptomi; fiziološka adaptacija; terapija

are a set of symptoms and reactions of people whose organisms cannot adjust. According to the stated, generally accepted definition, meteorosensitive persons are individuals who experience health problems or deterioration of chronic diseases associated with bad weather conditions and weather changes. Meteoropathy symptoms usually occur 24 to 48 hours before weather change, usually last a day or two and pass when the organism is adjusted to new weather conditions or they withdraw [1–4].

Many contemporary studies, as a recent study on heart attacks conducted in Sweden, revealed that the incidence of heart attacks varies by month and day, that summer months are safer than winter months, and Monday is more risky than Saturday [5]. A previous research performed at the Neurology Clinic in Novi Sad suggests that the time of winter and spring holidays, preceded by excessive exposure to food, alcohol consumption, smoking

Abbreviations

ACTH – adrenocorticotrophic hormone
 MS – multiple sclerosis
 SAD – seasonal affective disorder

and prolonged sitting, are periods with the highest incidence of strokes [6].

We are witnessing a systematic public warning by media about health risks that all or certain groups of people are exposed to during extreme or less intense changes of meteorological factors. Today we know that almost all people respond in a certain way to adverse weather conditions that cause electromagnetic waves affecting the hypothalamus, indirectly enhancing the secretion of stress hormone, adrenocorticotrophic hormone (ACTH) and reducing hormone of happiness (endorphin), which leads to increased anxiety, headache and other meteorological symptoms.

In psychophysically unstable persons and those susceptible to weather changes, stress can be a trigger for changes in the body that can make them vulnerable to various physical and mental disorders. Increase in stress levels also enhances the brain cells activity of the amygdala nucleus, part of the brain responsible for emotions. Thus, at any time, it may coincide with an increase in the level of stress hormones in the organism triggered by return to work on Monday, from vacation, during winter and spring holidays, and encourages the bone marrow to produce more immune cells for the defense from stress. This causes inflammation that can damage the arterial vessels responsible for the brain function [3, 5, 7] and so in the natural environment of the living world, it is a vicious circle from the beginning to the end, the chain of events continues to occur repeatedly.

One of the causes of meteoropathy, especially in the urban population, is human alienation from nature, which results in poorer ability to adapt to weather changes [7]. The description of modern life of people “living in concrete cities looking like graveyards with traffic lights” vividly depicts the above assumption.

Is meteoropathy a disease of individuals at risk, or can it affect anyone?

Meteoropathy is not a disease, but rather a condition, an overreaction to weather changes. Despite developments of medicine as a science, it has not yet been fully explained what exactly occurs in the body reacting to this overwhelming phenomenon. This certainly is not a reason to deny that weather affects human health. Meteoropathy exists, many are susceptible to it, and it is assumed that it affects about 30% of the general population, which makes it very common. If the symptoms occur in young and healthy people, they are mild and almost imperceptible, but in older people and chronic patients it can be severe, so they require special treatment.

In some cases these patients need hospital treatment. It is especially dangerous for people with severe illnesses, because they can seriously deteriorate their health, even lead to fatal outcome.

The most vulnerable categories are middle-aged people, women more than men, especially menopausal women but everybody, even children, can suffer from meteoropathy. Meteoropathy symptoms often occur before or after the weather change, rather than at the time of change [3, 7].

Which meteoropathy symptoms are associated with neurology and/or psychiatry?

Meteoropathy symptoms induce responses of the nervous system that are various and represent disorders associated with any psychic or nerve function - thinking, emotions, attention, memory, will, instincts, observations, sensory and motor functions, coordination of movements especially when changing position, balance maintenance, etc. [8].

Weather changes in meteorosensitive persons cause headaches, especially migraines; buzzing in the head, imbalance, weakness, irritability, insomnia, concentration and will deficit, decrease in work and life energy, etc. These symptoms last till the weather conditions improve, and the symptoms decrease and gradually disappear.

In healthy and younger people, symptoms include psychophysical fatigue, mood swings, reduced concentration, apathy, and pain at the site of old injuries and scars may occur.

Symptoms of chronic mental and neurological disorders are exacerbated or are associated with other organic diseases. They include hypersensitivity to pain, headache, dizziness, buzzing in the ears, nervousness, anxiety, depression, rapid heart rate and breathing difficulties [7, 8].

It is known that solar flares, coronal mass ejections and solar energetic particles are driven by the solar magnetic field have great influence on the Earth, which protects itself by its magnetic field. However, a certain amount of radiation comes to the Earth and affects human health, especially in the first three days after the beginning. It is associated with nervous system problems – in some persons conditioned reflexes get slower, resulting in an increased number of traffic accident others have a heavy leg feeling, accelerated pulse, poor vision, etc. There are people who can anticipate solar flares, while others have problems a few days later [7].

How do meteorosensitive persons react to sudden drop in temperature and changes in atmospheric pressure?

The nervous system and sensory organs register external influences on physical and mental functions responding to everything, most of all to turbulent meteorological changes, to which they react in various ways.

Sudden weather changes are not pleasant for anybody, but sensitive people experience serious problems. At temperatures above 30°C, or when humidity exceeds 70%, the thermoregulation system tries to cool the body, which is an additional effort for the cardiovascular system. This also threatens to supply the brain with nutrients and gaseous substances from arterial blood, because high temperatures cause spreading of the blood vessels and drop of blood pressure. In order to cool the body, sweating is increased and fluid loss occurs [3, 9, 10].

Residential air conditioning with a difference between indoor and outdoor temperature over 7° C is another health risk for meteorosensitive individuals due to sudden cooling. The organism responds to such a fall in temperature by contraction of blood vessels in order to reduce the body temperature, resulting in an increase in cardiac and vascular resistance [4].

Recent studies in Germany and the United States have shown that cloudy and cold weather may cause bad mood, but also that in general population the connection is not clear. This means that low temperatures, rain and wind have much less impact on the mood than it has been previously thought. Chilly weather, however, increases the incidence of angina attacks, strokes and heart attacks as blood becomes denser and increases the tendency to blood clotting [9, 10].

In contrast, the symptoms of multiple sclerosis (MS) are exacerbated when the external temperatures are high, and the patients feel too hot, so the summer rains and cooler weather are a relief. For example, therapeutic benefits of "Atomic Spa" in Gornja Trepča (near Čačak, Serbia) in MS patients may be attributed to the low-radioactive water, but also lower temperatures. The accuracy of this assumption is indicated by exacerbation of MS patients if they are taking warm baths.

When the atmospheric pressure drops, the body fluids and gases are spreading, and it results in pains, as the pressure of fluid and air inside the joints of the inflamed tissues or injuries causes increased pain. In the same way, sinus headaches increase.

And so, it is a vicious circle; the previous problem causes another one due to the consequent state opposite to the one that produced it in the first place. The problems will pass when the circumstances are back to normal, to which the organism is adapted [3, 7].

How to help meteorosensitive individuals?

We are witnessing rapid climate changes with significant daily temperature differences, and people's interest in weather and its effects on health is growing around the planet. A new branch of meteorology has been developed – biometeorology that deals with the influences of weather factors on the whole living world. Bio-meteorological forecast contains a description of the meteorological situation and announces weather conditions that may adversely affect the health of particular groups of people.

The mass media inform us about the bio-meteorological forecast on daily basis e. g. how long the changes will take place, about their intensity, as well as whether there will be any harmful risks for weather-sensitive persons. The purpose of these information is to take preventive measures regarding exposure to environmental changes, stay indoors in air-conditioned spaces till the air temperatures and intensity of ultraviolet radiation are harmful to health; follow a healthy diet regime - low calorie diets, avoid all harmful forms of behavior, mandatory use of preventive doses of drugs to prevent the aggravation of chronic diseases and so on [1].

People should regularly follow the bio-meteorological forecasts, so that they can prepare and avoid upcoming difficulties. The proposed measures should preferably be applied at least three days before the expected occurrence of climate changes. All of the above turbulences represent the so-called "meteorological stress" that can aggravate the general state of chronic patients. However, the statistics show that unfavorable outcomes are more common in the period from October to May than during the summer months [10].

How long does it take to adapt to the changing weather conditions?

When the weather suddenly changes or the adverse weather conditions last longer, like during cold or heat waves, in days of increased humidity and consequently lower air pressure, the pituitary gland increases secretion of the stress hormone, adrenocorticotrophic hormone (ACTH) that causes anxiety and irritation, and due to the simultaneous reduction, the secretion of endorphins (natural analgesics) the threshold of pain decreases and the subjective feeling of pain increases.

The second reason for amplified pain is explained by the laws of physics: due to the fall of atmospheric pressure, fluids and gases are spreading in the body and their increased pressure on the inflamed tissues or injuries increases the painful sensation.

The importance of this issue was long ago seen in the Dubrovnik Republic and some other Mediterranean countries in a provision about never deliberating and making decisions when the southwind (Jugo), was blowing. It was seen as a mitigating circumstance when judged on crimes committed during Jugo [7, 10].

Is the treatment of meteoropathy symptoms different from the treatment of other disorders?

There is an increasing awareness of weather conditions affecting the health of people, especially in chronic patients. Many developed countries have established specialized institutions and centers to study these impacts, such as the Research Center in Bioclimatology, Biotechnology and Natural Medi-

cine of the University of Milan, which studies these effects and, accordingly, prepares specific weather forecasts for meteorosensitive individuals. The elimination of negative weather conditions certainly helps to follow the instructions derived from biometeorological forecasts. Their goal is to alert sensitive people in a timely manner and reduce the impact of adverse weather conditions on their health to the smallest possible extent.

The preconditions for good health that diminish the impact of weather changes are primarily: healthy diet of foods rich in magnesium and vitamins, especially B-complex or supplements based on these nutrients, with fresh and varied fruits and vegetables, avoidance of processed and fatty foods, alcoholic beverages and cigarette smoking, adequate daily fluid intake and sufficient sleep, less psychophysical stress, avoidance of being outdoors during periods of unfavorable circumstances and staying in ventilated, naturally-lit rooms. In addition, all and especially meteorosensitive persons should spend at least half an hour a day walking in fresh air far from traffic jams, favorably in the morning and in the evening, in hot days take showers a few times a day, alternating hot and cold water, follow the diet regimes and avoid taking synthetic medications. As an example among many, we would like to mention that diet based on soy or lecithin, herbal teas - lemon balm, chamomile, hawthorn and valerian, especially if taken one or two days prior to announced weather changes, as well as regular physical and mental exercises, represent a good choice when fighting against weather disturbances [7, 9].

When should meteorosensitive individuals use medications?

As a model of treatment, the same treatment as in patients with seasonal affective disorder (SAD) is recommended. It is a type of depression that is related to changes in seasons, associated with the following symptoms: significant lack of energy, mood swings when the outside temperatures are lower, when the patients sleep longer (in summer about 7 hours on average, during autumn and winter longer than 10 - 12 hours, and they still feel a lack of sleep) and they are hard to wake, have low concentration, no interest in everyday activities, they are lifeless, avoid contact with other people, prone to weight gain because they need foods rich in carbohydrates and are sexually inactive, but all of these symptoms disappear with the arrival of spring. Persons with a mild form, should spend more time outdoors or, if that is not possible, use every opportunity to sit in bright places, best at the window. Those who suffer from severe forms, need medical therapy. Overusing medications should be avoided, because good results are achieved by using light therapy, and if it does not lead to satisfactory results, antidepressant and psychotherapy are prescribed. Apart from the described SAD, character-

istic for cold season, there is an opposite disorder, when people feel good in the winter and as the days become warmer their mood becomes worse and they have symptoms that are contrary to those that characterize winter affective disorders.

People who are sensitive to these and other weather changes should have three vegetable and two fruit meals a day. Spring and summer are ideal for this recommendation, because at high temperatures, nothing can replace refreshing meals. Easy to digest foods with lots of fresh vegetables, refreshing salads, seasonal fruits are ideal for the hottest part of the year, because they satisfy hunger and thirst at the same time. Nutrition based on fresh fruits, some vegetables and sufficient fluid intake is an irreplaceable advice to meteorosensitive persons. Fats and fatty foods increase the circulation in the digestive tract and "steal" it from the general circulation, which is practically analogous to the already harmful physical effort; these persons should quit smoking, alcohol drinking, and artificial sweeteners, very cold, carbonated drinks and coffee, whereas short morning and evening walks are very useful.

As mentioned above, one should pay attention to the use of air conditioners, sun exposure from 15 minutes to half an hour is safe (until 10 am, after 5 pm in the afternoon), in the shade rather than direct exposition. Sudden peripheral cooling is associated with centralization of blood circulation, higher heart load and higher energy consumption, and if bathing is planned, it is necessary to gradually adapt to the water temperature. The greater the difference between the water and air temperature, the more caution is needed. All of the above applies also to people who spend time in the mountains, because at high altitude the partial pressure of oxygen is lower and consequently the supply of necessary oxygen to the cells of the nervous system is lower [1, 7, 9, 11].

Why is self-medication dangerous?

We will explain this in case of a summer vacation in a very warm place, where the adaptation period is the most dangerous e.g. in the first four days in the new environment. The optimal time for such a holiday is at least three weeks - the first for adjustment, the other two for relaxation and enjoyment. During such holidays, the prevention of disorders implies avoiding major psychophysical efforts, staying in the sun during strong UV radiation, and adherence to the already stated measures of the dietary regime. As you can see, no medications are mentioned, especially self-medication. Drug use is justified only if there have been accompanying symptoms, such as unconsciousness and dizziness due to high temperatures, blood vessel spreading and blood pressure drop.

Excessive exposure to heat leads to the redistribution of blood from the central circulation into the peripheral, e.g. from the diseased to the healthy segments of the damaged organ, where the spread of

the arteries is not uniform because the damaged blood vessels are less spread and brain blood supply is insufficient. These problems can be avoided by regular health control before exposure to weather changes, regardless of where they take place, and only if necessary, revision of the previous therapy is performed, but by the doctor, not on our own. It specifically refers to patients who are taking psychoactive drugs, diuretics and calcium channel blockers whose mechanisms of action, side effects and complications are not known by most meteorosensitive individuals. Drug doses should generally be reduced, because on the one hand blood vessels are expanding for thermoregulation, and on the other hand, these are the effects of some drugs, for example doses of diuretics should be decreased, as further loss of fluids by sweating is expected. Non-compliance with these instructions may cause extremely dangerous consequences, as well as severe nervous, mental, and cardiovascular disorders requiring hospital treatment or emergency ambulatory intervention [1, 9].

It is good to live according to the laws of nature before weather changes as well!

Let's just repeat and highlight the above points: meteorosensitive persons, like other people, should spend half an hour per day in the fresh air, walking as the most appropriate physical activity, at least 30 minutes a day, 3 - 4 hours per week. It is beneficial to accelerate the circulation, by taking hot and cold showers, and spend time in well ventilated and bright rooms. Hydration with recommended daily fluid intake, preferably water, is of utmost importance; if one cannot consume natural mineral and vitamin-rich foods, he should use synthetic dietary supplements on regular basis, best during the meals, and it is especially important to eliminate all unhealthy habits, primarily smoking and alcohol drinking, which increase the body temperature and affect the loss of fluids [4, 10, 11].

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