

## SUMMARY

Outdoor atmospheric conditions are a risk factor for certain diseases. Dependent on the weather or the climate there may occur a headache, arthralgia, susceptibility to some infections, or non-infective respiratory tract disorders. A connection has been found between vascular diseases, namely, aortic dissection, myocardial infarction, exacerbation of heart failure and stroke with the weather. Outdoor thermal conditions may affect mental disorders e.g. the number of suicides or frequency of depression. One of the aspects of how the weather affects the human body is its impact on the thermal balance which initiates physiological adjustment reactions.

The biometeorological factor which properly describes the impact of the thermal conditions on the human body is called Universal Thermal Climate Index (UTCI). This indicator allows to categorize the atmospheric milieu according to the thermal comfort for 8 classes, the first 4 of which denote cold stress, the next one can be referred to as thermoneutral, while the last 3 describe heat stress. For the purposes of our analysis we have received meteorological data from the Meteorological Station in Olsztyn which belongs to the Institute of Meteorology and Water Management in Warsaw.

The aim of our study was to analyze the influence of the atmospheric conditions on certain outpatient disorders. Especially, we have established a clear connection between the weather and its impact on respiratory tract infections (RTI) as evident in the number of consultations due to arterial hypertension and levels of lipid compounds in human plasma: total cholesterol, HDL cholesterol and triglycerides.

In the first work there was carried out a retrospective analysis in the years 2012-2015 admissions to 2 primary care outpatient clinics Pantamed Ltd. and NZOZ Atarax, ambulance services of the Regional Ambulance Station in Olsztyn and the Emergency Department of the Regional Specialist Hospital in Olsztyn. From 452,674 medical records 67,548 cases were allocated to our study with diagnoses from J00 to J22 and A38 according to ICD10. Analysis was performed in 7 age groups and by gender verifying the percentage of consultations due to RTI in all admissions. Next we ascertained the number of hints in consecutive weekdays, months and periods

specified by UTCI classes. Subsequently, we have inspected correlations between the number of consultations for RTI and air temperature, atmospheric pressure, relative humidity, wind speed and UTCI. Moreover, by applying a mathematical method of curve fitting there was tested the interval between a substantial decrease in UTCI values and a rise in the number of RTI. We have observed a visible seasonality incidence of RTI - the highest during the lowest UTCI values (winter) and lowermost when UTCI values were uttermost (summer). The number of consultations was statistically higher ( $p < 0,001$ ) during cold stress and lower under the heat stress compared to thermoneutral conditions. It was revealed that from meteorological factors the most strongly correlated with RTI was UTCI (negative correlation) and subsequently air temperature (negative) as well as weaker relative humidity (positive). Atmospheric pressure and wind speed were not correlated with RTI. For the UTCI correlation the coefficient was  $r = -0,767$ . There was observed a substantial increase in RTI consultations each second week after the first autumn weather breakdown manifesting by duplication of the number of RTI consultations compared to two weeks preceding the interstice. The mean interval between a relevant decrease in UTCI values and an increase in the number of RTI consultations was about 10,5 days.

In the second study there was conducted a diagnostic analysis from the service register of the Regional Ambulance Station in Olsztyn and the Emergency Department of the Regional Specialist Hospital in Olsztyn in the years 2012-2015. From the number of 156,285 records in total for the purpose of analysis, 5578 (3,57%) records were incorporated as they represented diagnoses from I10 to I15 according to ICD10. The mean daily number of admissions due to high blood pressure in consecutive months of the year and according to UTCI classes was calculated. The relative risk for consultations due to hypertension was determined depending on UTCI classes and gender. Moreover in women cluster in connection with a high statistical significance there was performed analysis in 3 age sections containing pre-, peri- and postmenopausal periods. A statistically significant increase in the number of admissions for hypertension during winter months (January-February) compared to summer months (May-September) was revealed ( $p < 0,001$ ). An average daily number of visits of women during very strong cold stress was 3,8 while in thermoneutral conditions 2,42 ( $p < 0,001$ ). For men the difference was lower 1,4 vs 0,97 ( $p < 0,028$ ).

More susceptible to cold stress were younger women (under 45) and older (over 55). A cluster of women in middle age (perimenopausal) didn't display statistical significance between cold stress and the number of admissions to the healthcare system due to hypertension.

In the third research there was conducted retrospective analysis of outpatient laboratory tests: total cholesterol, HDL cholesterol and triglycerides. The results were obtained from laboratories of the Municipal Hospital in Olsztyn and Olsztyn branch of the Diagnostyka Ltd. in the years 2016-2018. There was calculated the mean lipids level in consecutive years, months of the year and days in cold stress, heat stress and the thermoneutral state. The impact of short term (week to week) strong change in thermal conditions on the level of lipid compounds was explored and also the effect of food dependencies before and after Easter and Christmas. A decrease in mean total cholesterol in both sexes in subsequent years ( $p < 0,001$ ) was observed and an increase in mean HDL cholesterol and triglycerides levels in both genders too ( $p < 0,05$ ). Total cholesterol and HDL cholesterol were in all years higher in females ( $p < 0,001$ ) and triglycerides lower than in men ( $p < 0,001$ ). It was noticed, in men and women alike, that appeared a statistically significant higher total cholesterol level in cold stress compared to heat stress ( $p < 0,001$ ). In the short term study (week to week) during a change in mean UTCI values by more than 10 degrees it was observed a higher total cholesterol level in women ( $p < 0,05$ ) during coolness. In men this change was not significant. Investigation of changes of mean lipid compounds after alimantal stimulus engendered by the impact on the population by Easter and Christmas revealed growths of total cholesterol by 4,56% ( $p < 0,05$ ) and HDL cholesterol by 7,25 ( $p < 0,001$ ) after holidays in men. In women an increase in triglycerides level by 13,4% ( $p < 0,01$ ) was observed after holidays.

UTCI is a valuable predictive parameter for forecasting seasonal changes in some medical events. Its usefulness was demonstrated in predicting an increase in morbidity of RTI and the number of admissions to healthcare system due to hypertension. However, the described changes in lipid levels despite visible seasonality are probably secondary to periodical diet modifications.