INDEX OF WEATHER VARIABILITY AND CEREBROVASCULAR DISEASE MORTALITY IN SOFIA

Zornitsa Spasova**,** assistant professor, PhD

National Center of Public Health Protection, Sofia, Bulgaria

Introduction. The researches made by a number of medics and physiologists eloquently point out that the weather affects all systems of the human organism. Especially vulnerable to the meteorological factor turns out to be the cardiovascular system (CVS). According to Mezernitsky, CVS ,,reacts more rapidly on the weather changes, compared to all other systems of the human organism" [2]. Ahmedzhanov [1] introduces the term ,,meteorological tolerance", which stands for the ability of the organism to resist the effects of unfavorable climatic conditions to a certain extent, without undergoing pathological reactions. A particularly low meteorological tolerance is observed in patients with cardiovascular diseases (CVD) - i.e., they have a high meteorological sensitivity. These conclusions have are particularly important, given the high social impact of CVD. The latter are the leading cause of mortality in most countries across the world. The problem is especially serious in the Eastern European region and Bulgaria in particular, where the relative part of the total mortality attributed to CVD could reach 51-66%.

The group of CVD with the heaviest social-economic consequences, namely the high percentage of invalidization and mortality, is dominated by the cerebrovascular disease. The relation between the season and the meteorological weather with the brain stroke has been a topic of many publications. A number of researches have confirmed the pronounced seasonal character of the cerebrovascular related mortality. In the case of the monthly and seasonal distribution of lethal cases of brain stroke, a maximum is observed during winter and autumn [2]. The minimum is during the summer season. Regarding the ischemic brain stroke, an increase of 50% is observed in the morbidity rate during winter, and a 15% increase in mortality, compared to summer [9]. The winter maximum in mortality from cerebrovascular diseases is confirmed by a number of researches by Western authors [3, 6, 11, 12, 15, 18 etc].

The reasons for the higher mortality from brain strokes in winter can be explained, firstly with the influence of air temperature, humidity, atmospheric pressure and other meteorological factors. ,,The lower temperatures cause a peripheral vasoconstriction and an increase in the blood pressure. The increase of the blood pressure leads to a deteriorating cerebral blood circulation and is followed by a brain ischemy. Moreover, aged patients with an arterial hypertony are more sensitive to lower temperatures" [9]. Some biochemical changes in the composition of blood also have an effect – an increase of the number of erythrocites, as well as cholesterole plasm and fybrinogen plasm, which are trombogenetic [11].

Regarding the influence of lower air temperature, it has been established that with a decrease of the average daily temperature below 12°C, the number of hospitalized patients with a cerebrovascular disease diagnosis increases drastically, reaching peaking at 4°C [14]. The increased mortality in the countries with a colder climate is approximately 1% per 1°C temperature decrease [15]. In their research of the WHO in 24 cities across Africa, Asia, Europe and Latin America, the authors investigate the number of hospitalized female patients under 50 years of age, and they find out that there is a correlation between the low temperatures and the increased risk of hospitalization. They point out that ,,every 5°C of daily temperature decrease is related to a 7% increase in the hospitalized cases with a brain stroke diagnosis" [3].

As soon as the beginning of the 20th century, the scientists have noticed that in summer, during

the hottest periods, the so-called „heat waves", a rapid increase of mortality related to CVD is observed. This issue has become particularly important in the last two decades, in regards to the global warming and the increased cases of extremely hot weather. A number of researches conducted in the USA before the mass use of air-conditioning show that during such periods, the adult mortality multiplies by 4. The most vulnerable contingent are the patients with cerebrovascular disease diagnosis [10]. According to [7], the number of deceased due to cerebrovascular diseases in the heat wave period exceeds the expected values by 2.2 times.

Regarding the air humidity, [5] points out that „there are more cases of CVD in the conditions of a relative humidity (RH) of 61 to 70%, and the lowest - at a RH of 80%". According to [3] there are no relation between RH and insults. The same conlusion has been reached regarding precipitation.

The atmospheric pressure, and its changeability in particular, is researched by most authors as a significant factor in the cases of brain apoplexy. Slavova (1967) establishes that in the cases of a stable atmospheric pressure, the average daily mortality from brain stroke is 6.8, and its decrease by 7hPa results in a 7.8 rate, while its increase by 7hPa results in a 7.9 rate [2]. The same author finds the highest mortality values in the cases of a weather of class XI, IV and VI (using the complex climatic classification of Fedorov-Chubukov). They are connected to the passing of atmospheric fronts. The negative influence of classes IV and VI on the blood pressure and the subjectively perceived problems has been confirmed in our own research [4].

A lot of attention has been paid in the literature to the influence of abrupt weather change on the mortality related to cerebrovascular diseases. In the conditions of Siberia [8], a straight correlation has been established between the so-called „weather changeability index" and the observed cases of brain trombosis (r=0.76). A weaker (but statistically significant) correlation is confirmed in [2], which, having researched in Novosibirsk, uses the same index (r=0.30).

Material and methods. The present article presents the results from a research on the influence of adverse meteorological factors on the mortality related to cerebrovascular diseases in the city of Sofia. The mortality from the given disease unite has been shown, according to gender in the age groups of 20 to 59 and over 60. The data on the number of lethal cases has been provided by the National Statistical Institute according to months for the period 2001-2005 included. Based on data on the population number, a mortality per 100,000 persons has been calculated. Meteorological data has been used, provided by the National Institute of Meteorology and Hydrology, as well as a number of internet websites. The statistical processing of the results includes a correlational and comparative analysis.

Using Rusanov's method, the monthly frequence of abrupt weather changes is observed. The author introduces an Index of weather changeability, which accounts for the contrasting meteorological changes, which are represented by the value of the daily change of the temperature, the change of cloudiness and the number of rainy days. A contrasting change of periods by month he considers: 1) a change of periods with a clear or overcast weather with periods of rain of 1 mm and more for 1 day (this period could include more days with rainfall of less than 1 mm); 2) a change of periods with clear or cloudy wather with periods of cloudy or clear weather with a changing average daily air temperature by 2,0°C; 3) a change of periods with any type of weather with inter-daily air temperature changes by 6,0°C.

The Index of weather volatility is calculated as a percentage of the number of days with a rapid weather change to the number of days within the same period (in this case - for the same month). A 100% weather volatility is regarded the daily weather change itself. The weather regime is considered very stable if this index has a value lower than 20%, stable – between 21÷35%, changeable – 36÷50%, and very changeable – over 50% [2]. During the various months of the researched period, all types of weather regime were observed, with the exception of the very changeable type.

Results and discussion. Our resuts point towards an insignificant influence of the abrupt

weather changes on the mortality related to cerebrovascular diseases. Both in the whole excerpt and in the gender distribution, the correlation quotients do not reach a statistical significance (r=0,16 with males and in general, r=0,14 with females and in the age group over 60, and r=0,12 in the group 20÷59 years of age). In the comparative analysis too, no significant t-quotients have been observed.

This result probably explains the influence of air temperature extremes. The abrupt weather changes are usually related to the passing of atmospheric fronts, while the stable weather is caused by a stable, anticyclon state of the atmosphere. Consequently, the temperature extremums – both the extreme frost and heat, are ,,linked" to the anticyclon state of the atmoshere.

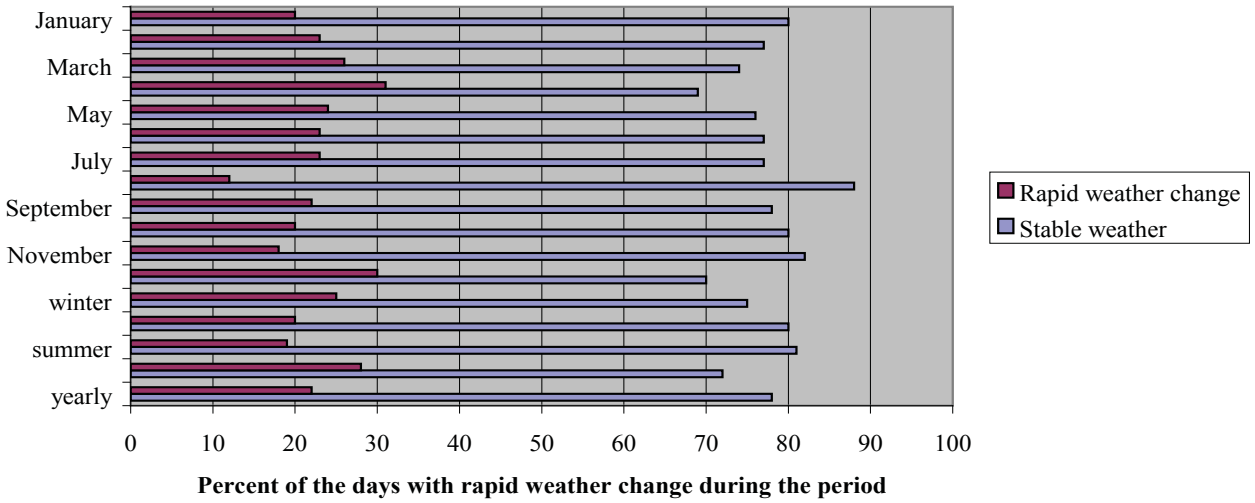

Figure 1. Rapid weather changes in Sofia (Bulgaria)

Generally the climate of Sofia is characterized by a stable regime – the Index of weather variability is 22.5% (see figure 1). Each season is also characterized by this type of weather system, with the exception of the summer, when the weather is most stable. During this period, the index of weather volatility has a value of less than 20% – i.e. there is a very stable regime. August is the month with the lowest number of days with abrupt weather changes – only 12.1%. Next comes autumn, with a regime close to stable – the index is 20.3%. The reason for the rare occurrence of rapid weather changes during this period is the prevalence of anticyclone weather situations that cause the clear and quiet weather. In late autumn, in addition to the increase of cyclone activity, the contrasting weather changes also increase.

Conclusions. The slight discrepancy between these results and the data obtained from the literature makes necessary the further precision of our research on the influence of the abrupt weather changes on the mortality related to cerebrovascular disease, as these are expected to become more frequent, given the currently observed climate changes on a global scale.

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Summary

The present article presents the results of a five-year research (2001-2005) on the influence of the abrupt weather changes calculated by the Index of weather variability provided by V. I. Rusanov on the cerebrovascular disease mortality in the city of Sofia.

Our findings didn't point towards a significant influence of the abrupt weather changes on the mortality related to cerebrovascular diseases. Possible reasons for that had been discussed. The slight discrepancy between these results and the data obtained from the literature makes necessary the further precision of our research on the influence of the abrupt weather changes on cerebrovascular disease mortality, as these are expected to become more frequent, given the currently observed climate changes on a global scale.

НЕУТИЛИЗИРОВАННЫЕ ПЕСТИЦИДЫ ИЗ ЧИСЛА СОЗ И ОЦЕНКА УРОВНЯ ЗАГРЯЗНЕНИЯ ИМИ ПРОДУКТОВ ПИТАНИЯ И ОРГАНИЗМА ЧЕЛОВЕКА

Ана Волнянски, док. мед. наук, ***Татьяна Стратулат***, док. биол. наук, ***Раиса Сырку***, док. биол. наук, ***Павел Соколюк***

Национальный Центр Общественного Здоровья

Введение. В группу стойких органических загрязнителей (СОЗ) в настоящее время включено более 30 химических веществ, в том числе 8 пестицидов (альдрин, хлордан, дильдрин, эндрин, гептахлор, мирекс, токсафен, ДДТ), широко использовавшихся в сельском хозяйстве в 60-70-е годы прошлого столетия. Эти пестициды относятся к классу хлорорганических соединений (ХОС) и обладают рядом признаков: способностью к биоконцентри-