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Gender Differences in the Influence of Terrestrial and Cosmic Weather on Hypotensive Therapy Effectiveness for Elderly Patients with Arterial Hypertension Stage 3

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Abstract: It is known from previous works that about a third of men and almost half of women are sensitive to changes in weather conditions. Approximately 65 - 75% of patients with cardiovascular diseases suffer from weather sensitivity. These patients may be dependent on atmospheric variations in temperature and pressure, relative humidity, and geomagnetic activity. In recent years, the dependence f weather-sensitive people on geomagnetic perturbation has been reliably established. The purpose of our research was to find out correlations between Earth and cosmic weather factors and hemodynamics parameters alongside therapy with IATE (prestarium, noliprel) and BRA2 (lozap, Losartan, lorista, blocktran) in elderly patients with arterial hypertension stage 3, degree 3 and influence of terrestrial factor on hypotensive effect. 185 elderly patients with arterial hypertension were examined, including 79 men and 106 women between the ages of 60 to 88. The task: to investigate the results of treatment of elderly patients with hypertensive disease stage 3, degree 3 of IATE and BRA 2 in the gender aspect and to test the effectiveness of the receiving hypotensive therapy alongside meteorological (atmospheric temperature, humidity, atmospheric pressure) and geomagnetic factors (geomagnetic activity expressed by the total planetary Kp-index). It is known that the cardiovascular system parameters are influenced by the parameters of terrestrial and space weather. Despite a large number of studies on the role of fluctuations in weather factors on cardiovascular parameters, this question has not been examined in the gender aspect in elderly patients with hypertensive disease stage 3 degree 3. We demonstrated the influence of changes in atmospheric temperature, air pressure, humidity and Kp-index of geomagnetic activity on heart rate and arterial blood pressure alongside therapy with IATE and BRA2 in elderly women and men, suffering from hypertensive disease stage 3. There were no differences in hypotensive effect of IATE between women and men. But there were differences in hypotensive effect of BRA2 between women and men.

Keywords: Space Weather Factors, Gender Differences, Angiotensin-Transforming Enzyme Inhibitors (IATE), Angiotensin Receptor Blockers 2 (BRA2), Coefficients Correlation, Elderly Patients, Arterial Hypertension

1. Introduction

Among the tasks of paramount importance in the treatment of arterial hypertension is to find out the weather dependence of patients, as well as their reactions to geomagnetic activity, which can nullify the results of hypotensive therapy.

It is known from previous works that about a third of men and almost half of women are sensitive to changes in weather conditions. Approximately 65 - 75% of patients with

cardiovascular diseases suffer from weather sensitivity. These patients may be dependent on atmospheric variations in temperature and pressure, relative humidity, and geomagnetic activity. [1-3, 9].

In recent years, the dependence of weather-sensitive people on geomagnetic perturbation has been reliably established [10-14].

In clinical conditions the treatment of elderly patients with arterial hypertension has shown that variations in atmospheric temperature (temperature waves), as well as fluctuations in geomagnetic activity (magnetic storms) decrease the hypotensive drug effectiveness. [4-9].

Significant changes in atmosphere factors can lead to a failure of mechanism of adaptation in patients suffering from arterial hypertension.

2. Materials and Methods

185 elderly patients with arterial hypertension were examined, including 79 men and 106 women between the ages of 60 to 88. To objectify the detected gender differences in the function of the cardiovascular system, clinical symptoms, it was necessary to investigate not only the subjective sensations of patients with taking into account the gender, but also to conduct a modern instrumental study of cardiovascular function. To do this, a questionnaire was used in which patients marked the frequency of headaches, episodes of chest pain, occurrences of heart failure, general well-being, activity, and mood (WAM). The following instrumental methods were used: daily blood pressure monitoring (BP), which determined the daily profile of blood pressure, levels of systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse blood pressure (PBP), average blood pressure (ABP), heart rate (HR). Measurments were obtained in the morning and evening hours. RESULT We noted a decline in BP at night and a rise in BP in the morning. (specify time frame of night and morning)

For daily blood pressure monitoring (DBPM) we used a portable device "Schiller AT 10 plus" manufactured by Switzerland. Factors of terrestrial and space weather received from sites ftp://ftp.ngda.gov/STP/GEOMAGNETIC-DATA-INDICES/KP-AP and http://meteo.infospace.ru.

At the same time, we used information about atmospheric pressure, atmospheric temperature, relative humidity, Kp-index (index of geomagnetic activity) on the first day, fourth day, and eighteenth day of the patients hospital stay. Further comparisons were made between changes difference in weather factors and difference (d) of systolic blood pressure (dSBP), difference (d) of diastolic blood pressure (dDBP) and difference (d) of heart rate (dHR) in the dynamics of the observations. In doing so, the correlations between the difference (d) of these indicators and the difference of weather factors between the first day of arrival and the second day, fourth and through the eighteenth day of the hospital stay were examined in elderly men and women, suffering from hypertensive disease before and after therapy of BRA2.

3. Results

Elderly women receiving therapy have been found to have statistically significant correlations between difference in relative humidity and the heart rate difference on the 10th day of hospital stay compared to the day of admission ($r=0.199$, $p < 0.05$). A significant correlation between the difference in air temperature and the SBP difference and DBP difference on the 16th day of treatment compared to the day of admission ($r= 0.590$, $p < 0.03$ and $r=0.543$, $p < 0.05$). In addition, the difference between the KP-Index difference and the heart rate difference between the 4th day and the day of admission ($r=- 0.201$, $p <0.04$) was significant.

Analysis of correlations between difference in hemodynamic parameters and difference in weather factors in men with arterial hypertension, receiving IATE and BRA2, demonstrated significant difference between the first and fourteenth days of treatment for change in HR and atmosphere pressure ($r=0.484$, $p < 0.01$).

Differences between the second day of hospitalization and day of admission difference HR, difference SBP and difference humidity were significant ($r=-0.234$, $p < 0.03$) and ($r=0.224$, $p<0.03$). Correlations between differences in humidity and HR between the tenth day of hospitalization and the day of admission ($r=0.209$, $p < 0.05$) in men. Correlations between differences in atmosphere temperature and HR was significant when we compared the 8th and 10th days to the day of admission ($r=0,264$, $p < 0.01$) and ($r=0.212$, $p < 0.05$) respectively.

The correlation between the differences in Kp-index and in HR was significant on the 6th day compared to the day of admission ($r=0.209$, $p < 0.05$).

There was negative correlation between difference of atmospheric pressure, humidity, dHR, dSBP and difference Kp-index for elderly men. Analyses in comparative efficacy of IATE and BRA2 in elderly men and women with hypertensive disease stage 3 degree 3 discovered gender differences in hemodynamic parameters. Under an influence of BRA2 decreasing SBP, DBP, average BP, pulse BP, heart rate, double product (DP) in women was twice as frequent as in men.

The number of cardiac pain episodes decreased by two fold. Under the influence of IATE gender differences in hemodynamics in elderly men were absent. At the same time differences were revealed between elderly men and women in clinical symptoms.

Gender differences between daily profile blood pressure were absent. Both, IATE and BRA2, revealed normalization in the daily profile of blood pressure.

4. Discussion

Analysis of received data revealed differences between elderly men and women with hypertensive disease stage 3 degree 3 in reaction to changes parameters (difference) of atmospheric pressure, relative humidity, air temperature, Kp-index (index of geomagnetic activity). Correlation was noted

between difference hemodynamic parameters and weather factors in elderly women and men with arterial hypertension on the background of therapy with IATE and BRA2. There were noted differences in effects of IATE and BRA2 on clinical symptoms and hemodynamics parameters in elderly men and women with hypertensive disease stage 3 degree 3 with high cardiovascular risk. Significant correlations were noted between meteo-geomagnetic factors and hemodynamic parameters (SBP, DBP, HR) alongside hypotensive therapy. Weakening was revealed between changes in hemodynamic parameters and meteo-geomagnetic factors. When air temperature increases systolic blood pressure (SBP) and diastolic blood pressure (DBP) in men and women before therapy decreases. This dependence in women was development more expressive and safe after treatment. The difference was noted in response of SBP and HR for change Kp- index, while subjects received the therapy. The change in Kp-index causes SBP increase in men, but it causes SBP decrease in women.

Kp-index increase causes HR increase in men.

5. Conclusion

We demonstrated the influence of changes in atmospheric temperature, air pressure, humidity and Kp-index of geomagnetic activity on heart rate and arterial blood pressure alongside therapy with IATE and BRA2 in elderly women and men, suffering from hypertensive disease stage 3 degree 3.

Statistically significant correlations were noted in women between:

1. change in relative humidity and change in heart rate;
2. change in air temperature and change in systolic and diastolic blood pressure;
3. change in Kp- index and change in heart rate.

Statistically significant correlations were noted in men between:

1. change in atmospheric pressure and change in heart rate;
2. change in relative humidity and change in heart rate;
3. change in Kp- index and change in heart rate;
4. difference systolic blood pressure.

The weakening of correlations observed alongside obtained hypotensive therapy between hemodynamics parameters and meteo-geomagnetic factors.

The article is devoted to influence of Earth and cosmic factors on hypotensive effect of IATE and BRA2 in elderly women and men with hypertension disease stage 3 degree 3.

We considered means of arterial blood pressure monitoring, ECG, echocardiography in subjects.

Weather factors were obtained from sites:

ftp://ftp.ngda.gov/STP/GEOMAGNETIC-DATA-INDICES/KP-AP and http://meteo.infospace.ru.

Influence of the therapy with IATE and BRA2 considered alongside with weather factors in women and men, suffering from arterial disease hypertension stage 3 degree 3.

Correlations were noted between hemodynamic parameters and weather factors.-Hypotensive effect of BRA2 was more prominent in women, than in men.

There were no differences in hypotensive effect of IATE between women and men.

Differences were revealed in hemodynamic parameters between women and men alongside of fluctuation in atmospheric pressure, relative humidity, air temperature, Kp - index of geomagnetic activity. We observed correlations between meteo-geomagnetic factors and hemodynamic parameters.

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