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CHANGES IN THE FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM IN THE MIDDLE, ELDERLY AND OLD AGE DEPENDING ON THE SEASON

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ИЗМЕНЕНИЕ ФУНКЦИОНАЛЬНОГО СОСТОЯНИЯ СЕРДЕЧНО-СОСУДИСТОЙ СИСТЕМЫ В СРЕДНЕМ, ПОЖИЛОМ И ПОЖИЛОМ ВОЗРАСТЕ В ЗАВИСИМОСТИ ОТ СЕЗОНА ГОДА

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Abstract. The article reflects the study of the influence of climatic and seasonal factors on the body of people of middle, elderly and senile age. These factors significantly aggravate the course of many diseases, worsen health and reduce the body's performance. The incidence of cardiovascular disease is often associated with risk factors and seasons. Most people aged 65 years and older often suffer from hypertension. With age, the number of such patients increases significantly. Severe hypertension is rare in humans because patients with hypertension do not live to an advanced age or often develop complications. Changing seasonal factors requires great attention to the functional state of the cardiovascular system. Patients with hypertension are very difficult to adapt to changing weather conditions, which worsens the quality of life of the elderly and leads to various complications. Changes in blood pressure in people of middle, elderly and senile age depending on the season of the year have been established.

Аннотация. В статье отражено изучение влияния климатических и сезонных факторов на организм людей пожилого, пожилого и старческого возраста. Эти факторы значительно отягощают течение многих заболеваний, ухудшают самочувствие и снижают работоспособность организма. Заболеваемость сердечно-сосудистыми заболеваниями часто связана с факторами риска и временем года. Большинство людей в возрасте 65 лет и старше часто страдают артериальной гипертензией. С возрастом число таких больных значительно увеличивается. Тяжелая артериальная гипертензия у людей встречается редко, поскольку пациенты с артериальной гипертензией не доживают до преклонного возраста или у них часто развиваются осложнения. Изменение сезонных факторов требует большого внимания к функциональному состоянию сердечно-сосудистой системы. Больные гипертонией очень тяжело адаптируются к изменяющимся погодным условиям, что ухудшает качество жизни пожилых людей и приводит к различным осложнениям. Установлены изменения артериального давления у лиц пожилого, пожилого и старческого возраста в зависимости от сезона года.

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Keywords: blood pressure, season of the year, systolic pressure, diastolic pressure, winter, autumn, spring, summer, middle age, old age, old age, season.

Ключевые слова: артериальное давление, время года, систолическое давление, диастолическое давление, зима, осень, весна, лето, средний возраст, пожилой возраст, старость, сезон.

Relevance of the problem

It is important to trace the state of the cardiovascular system in the process of aging, depending on the seasons of the year. Painful meteosensitivity affects 65-75% of patients with cardiovascular diseases [4, 11, 12]. Underestimation of the influence of age-related features, in particular the cardiovascular system, on the development and course of many diseases in the elderly and old people often leads to errors in diagnosis and treatment [1]. There is a position that aging includes a complex process of adaptation of the body to new conditions [2].

Meteorological conditions have an adverse effect on the course of a number of diseases, often contributing to their exacerbation through overstrain and disruption of adaptation mechanisms, with the development of biorhythm disturbances in the body [1].

Arterial hypertension is the most common cardiovascular disease, its complication, primarily cerebral stroke and myocardial infarction, lead to a significant increase in mortality in developed countries [2, 3]. Many researchers have noted an increase in cardiovascular diseases and mortality in winter, especially in cold weather [5, 6]. In studies studying seasonal changes in the body's hemodynamics, an increase in pulse and heart rate was found [7].

According to medical statistics, in different countries, about a third of men and almost half of women have an increased sensitivity to changes in weather conditions [8-10]. meteorological conditions characteristic of the cyclonic type of weather affect pH and blood pressure, tissue permeability, aggravate the morbid condition of patients with arterial hypertension, lead to a breakdown in adaptation and an increase in blood pressure, increase the frequency of hypertensive crises and cardiovascular accidents [13, 15-17].

Nevertheless, the prolonged heat in the city of Osh in July and August, when the daily temperature exceeds 30°C almost all days, also necessitates the medical examination of patients with hypertension and targeted meteorological prophylaxis among them [13, 14]. It is important to trace the state of the cardiovascular system in the process of aging, depending on the seasons of the year. The study of the influence of meteorological factors on the state of the body, changes in blood pressure, is topical.

Purpose of the study: To study the change in blood pressure in people of middle, elderly and senile age in different seasons of the year.

Materials and methods

242 patients aged 35-75 years and older (men and women) were under observation. The study involved patients, residents of Osh with diseases of the cardiovascular system. The studied patients were divided into control and main groups depending on age. The control group consisted of 118 patients. It was divided into three subgroups (Ia, Ib, Ic). The main group consisted of 124 patients. It was divided into three subgroups (I, II, III). All control and main groups (including 110 women, 132 men) were examined in 4 seasons of the year.

- Ia-subgroup of men and women aged 35-60, of which 10 in spring, 10 in summer, 5 in autumn, and 15 in winter are healthy.

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- Ib-subgroup of men and women aged 61-75 years, of which 9 in spring, 8 in summer, 5 in autumn, and 15 in winter are healthy.

- IV-subgroup of men and women aged 75 years and above, of which spring time-12, summer-11, autumn-8, winter-10 people are healthy.

- I-subgroup main men and women aged 35-60, of which 11 in spring, 9 in summer, 6 in autumn, and 13 in winter

- II-subgroup main 48 patients, men and women aged 61-75 years were examined, of which 10 in spring, 10 in summer, 5 in autumn, and 23 in winter with diseases of the cardiovascular system.

- III-subgroup main 37 patients aged 76 years and above, including 14 in spring, 5 in summer, 7 in autumn, and 11 in winter with diseases of the cardiovascular system.

The survey was conducted in all seasons of the year, in order to study the dynamics of cardiovascular diseases, meteorological factors. The patient's blood pressure was measured. A tonometer was used to measure blood pressure. Blood pressure was measured in millimeters of mercury (mm Hg). When measuring blood pressure, 2 digital values were recorded: systolic and diastolic pressure. All the received factual material was subjected to computer processing using the Microsoft Excel package of applied programs with the calculation of the Student's criterion.

Results and discussions

In the control subgroup Ia in the spring, the level of diastolic blood pressure was 71.1±1.5 mmHg. In contrast to the spring period, in summer, diastolic blood pressure tended to decrease by 3.8%. In autumn, diastolic pressure increased by 3.2%, and in winter by 4.5%. In the main subgroup I, diastolic blood pressure in the spring period was 74.7±4.7 mm Hg. In contrast to spring, diastolic blood pressure decreased by 2.5% in summer, increased by 4.8% in autumn and 9.5% in winter.

In the main subgroup I, in contrast to the control subgroup Ia, the level of diastolic blood pressure increased in all periods: in spring by 5.0%, in summer by 6.5%, in autumn by 6.6%, and in winter by 10.0%. In the control subgroup Ib, diastolic blood pressure was 83.0±3.5 mm Hg. in spring, but was higher in all other periods: by 5.1% in summer, by 6.6% in autumn and by 5.3% in winter.

Diastolic blood pressure in the II main subgroup in the spring was 84.0 ±3.3 mm Hg, and in all other periods, in contrast, it was out by 5.9%, in autumn by 7.5%, in winter by 10.8 %. In the main subgroup II, in contrast to the control subgroup Ib, diastolic blood pressure in the spring remained within the physiological norm. In other periods, diastolic blood pressure increased: by 2.4% in summer, by 2.0% in autumn, by 6.5% in winter.

In the control subgroup I, diastolic blood pressure in the spring was 96.2±4.2 mm. rt. Art. In contrast to the spring period, in summer the level of this indicator remained within the physiological norm. In autumn it increased by 2.0%, and in winter by 5.5%. In the main subgroup III, diastolic blood pressure was 103.0±2.0 mm Hg. In contrast to the spring period, on the contrary, in summer it tended to decrease by 3.0%. In autumn, it significantly increased by 2.9%, and in winter — by 6.6%.

In the main subgroup III, in contrast to the control subgroup Ic, the level of diastolic pressure increased in all periods: in spring by 7.0%, in summer by 5.2%, in autumn by 7.9%, in winter by 8.1%. Thus, it was found that in the control subgroup Ia, the level of diastolic pressure, in contrast to the spring period, decreased in summer, increased in autumn and winter. In winter, there was a significant difference ($P<0.05$).

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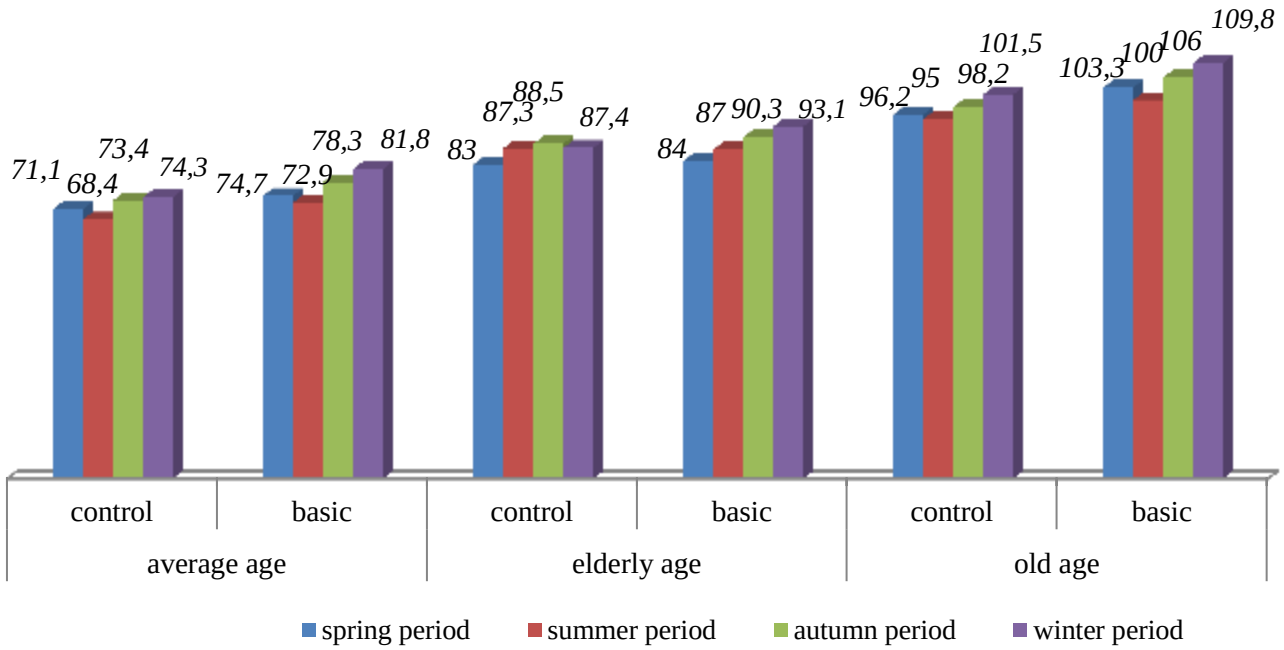
At the same time, in the main subgroup I, in contrast to the spring period, the level of diastolic pressure decreased in summer and increased in autumn and winter with a significant difference in autumn (P<0.05). the level of diastolic pressure increased in all periods.

It should be noted that in persons of the control subgroup Ib, in contrast to the spring period, the level of diastolic pressure increased in all periods (P<0.05). Similarly, in persons of the II main subgroup, in contrast to the spring time, diastolic pressure increased in all periods. A significant difference was observed in summer and winter (P<0.05). At the same time, in the II main subgroup, in contrast to the control Ib, diastolic blood pressure remained within the physiological norm in spring, and in summer, autumn and winter it tended to increase.

It should be noted that in the control subgroup I, in contrast to the spring period, diastolic blood pressure remained within the physiological norm in summer and significantly increased in autumn and winter (P<0.05). Moreover, in persons of I and II of the main subgroup, in contrast to the spring period, diastolic blood pressure decreased in summer, and significantly increased in autumn and winter (P<0.05). As well as in the main subgroups I, II, diastolic blood pressure in persons of the main III, in contrast to the control subgroup Ic, increased in all periods (Figure 1).



Note: * P<0.05, significant to the spring period and the control subgroup

Figure 1. Data of indicators of diastolic blood pressure in the control and main subgroup

In the control Ia subgroup in the spring, systolic blood pressure was 113.4±1.5 mm Hg. In contrast to the spring period, in summer it decreased by 4.6%. With the onset of autumn, it tended to increase by 2.1%, and in winter by 2.6%. In the main subgroup I in the spring, systolic blood pressure was 117.0±4.7 mm Hg. In contrast to the spring period, in summer the level of systolic blood pressure decreased by 4.8%. In autumn, it remained within the physiological norm. With the onset of winter, there was an upward trend of 4.5%.

In the main subgroup I, systolic blood pressure increased in all periods, in contrast to the control subgroup Ia: in spring by 3.5%, in summer by 3.3%, in autumn by 2.0%, and in winter by 5.4%. In the control subgroup Ib, systolic blood pressure in the spring period was 121.0±3.5 mm Hg. In contrast to the spring period, in summer systolic pressure decreased by 2.5%. In autumn, it remained within the physiological norm. In winter, it increased by 3.2%.

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In the main subgroup II, systolic blood pressure in the spring period was 125.4±4.7 mm Hg. In contrast to the spring period, in summer it tended to decrease by 2.2%. In autumn, systolic pressure increased by 8.1%, and in winter by 11.0%. In the II main subgroup, in contrast to the control Ib, systolic blood pressure increased in all periods: in spring by 3.3%, in summer by 3.7%, in autumn by 9.7%, in winter by 11.1%.

In the control subgroup I, systolic blood pressure in the spring period was 144.7±2.2 mm Hg. In contrast to the spring period, in summer it decreased by 2.3%. Since the beginning of autumn, it remained within the physiological norm. In winter, it tended to increase by 3.8%. In the main subgroup III, systolic blood pressure was 156.4±4.7 mm. rt. Art. In contrast to the spring period, in summer it tended to decrease by 3.1%. With the onset of autumn, it increased by 2.8%, and in winter by 5.1%.

In the main subgroup III, systolic blood pressure increased in all periods, in contrast to the control subgroup Ib: in spring by 8.0%, in summer by 7.2%, in autumn by 9.2%, in winter by 9.5%. At that time, in the control subgroup Ia, the level of systolic pressure, in contrast to the spring period, decreased in summer, significantly increased in autumn and winter ($P<0.05$).

Moreover, in persons of the main subgroup I, in contrast to the spring period, the level of systolic pressure decreased in summer, remained within the physiological norm in autumn, and increased in winter. In summer and autumn it has a significant difference ($P<0.05$). It can be noted that in the main subgroup I, systolic blood pressure was higher than normal in all periods, in contrast to the control subgroup Ia.

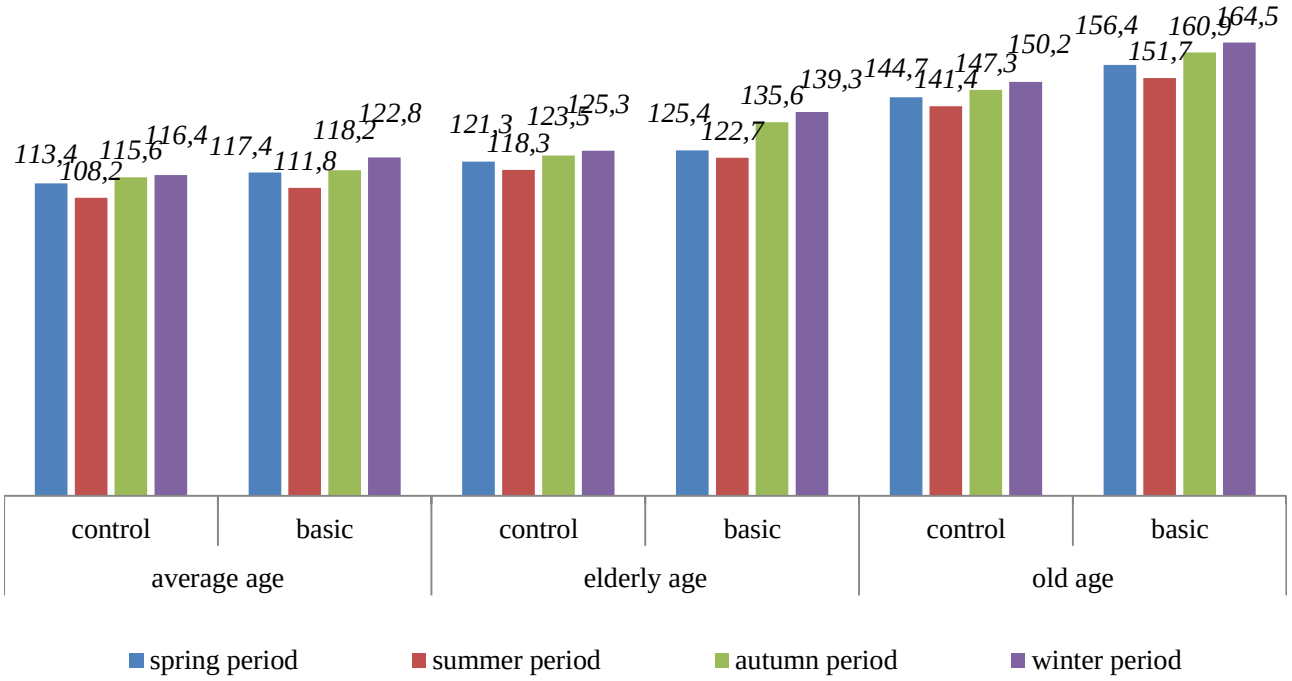
Meanwhile, in persons of the control subgroup Ib, in contrast to the spring period, it decreased in summer, remained within the physiological norm in autumn, and increased in winter, where a significant difference was observed in summer and winter ($P<0.05$). It was revealed that in the main subgroup II, in contrast to the spring period, systolic pressure decreased in summer, increased in autumn and winter, where there was a significant difference ($P<0.05$) in these periods.

It is important to note that in patients of the II main subgroup, in contrast to the control group Ib, systolic pressure increased in all periods. It turned out that in the control subgroup I, in contrast to the spring period, systolic pressure decreased in summer, was within the physiological norm in autumn, and increased in winter. There is a significant difference in summer and autumn ($P<0.05$). Systolic blood pressure in the III main subgroup decreased in summer, increased in autumn and winter, where it has a significant difference ($P<0.05$) in contrast to the spring period.

Moreover, in patients of the main subgroup III, in contrast to the control subgroup Ic, systolic pressure increased in all periods (Figure 2).

Conclusion

It was established that in the middle age in different seasons of the year, blood pressure was within the normal range. The study also revealed the relationship between seasonal temperature and blood pressure levels. It was found that systolic and diastolic blood pressure change in different seasons and depending on air temperature. A high level of systolic and diastolic pressure was typical for the winter period. In the spring there was a decrease in pressure, especially systolic. Thus, BP decreased during the transition from the winter season to the spring period. In summer, blood pressure and heart rate were lower than in spring. More often, such a change was observed in elderly and senile people, which may be associated with meteosensitivity, especially indicators of the cardiovascular system. Such a change can be considered as an adaptive response of the body to changes in ambient temperature. When the seasons change, hemodynamic parameters (blood pressure) significantly increased in people over 65 years of age, in contrast to other subgroups. Blood pressure levels fluctuate seasonally, with a maximum in winter and a minimum in summer.



Note: *P<0.05, significant to the spring period and the control subgroup

Figure 2. Data of indicators of systolic blood pressure in the control and main subgroup

References:

1. Agadzhanyan, N. A. (1983). Adaptatsiya i rezervy organizma Moscow.

2. Dzhuvalyakov, P. G. (2002). Vliyanie meteorologicheskikh i geogeliofizicheskikh faktorov na smertnost' ot ishemicheskoi bolezni serdtsa v g. Astrakhani: diss. kand. med. nauk, Astrakhan',

3. Serdyukov, A. G., Vinnikova, Yu. G., & Kul'kov, V. N. (1999). Dinamika smertnosti naseleniya Astrakhanskoi oblasti: (Sots.-gigien. issled.). Astrakhan.

4. Ananikova, V. V., & Bonkalo, T. I. (2021). Dezadaptivnye perezhivaniya lits pozhilogo i starcheskogo vozrasta: preodolenie odinochestva v gerontologicheskom tsentre. *Trudy Nauchno-issledovatel'skogo instituta organizatsii zdravookhraneniya i meditsinskogo menedzhmenta*, 14-19.

5. Baker-Blocker, A. (1982). Winter weather and cardiovascular mortality in Minneapolis-St. Paul. *American journal of public health*, *72*(3), 261-265. https://doi.org/10.2105/AJPH.72.3.261

6. Stott, P. A., Stone, D. A., & Allen, M. R. (2004). Human contribution to the European heatwave of 2003. *Nature*, *432*(7017), 610-614. https://doi.org/10.1038/nature03089

7. Izzo Jr, J. L., Larrabee, P. S., Sander, E., & Lillis, L. M. (1990). Hemodynamics of seasonal adaptation. *American journal of hypertension*, *3*(5_Pt_1), 405-407. https://doi.org/10.1093/ajh/3.5.405

8. Jullien, L., & Gautier, A. (2017). Hybrid fluorescent probes for imaging cellular proteins on demand. *Medecine sciences: M/S*, *33*(6-7), 576-578. https://doi.org/10.1051/medsci/20173306006

9. Zenchenko, T. A., Tsagareshvili, E. V., Oshchepkova, E. V., Rogoza, A. N., & Breus, T. K. (2007). On the issue of the effects of geomagnetic and meteorological activity on patients with arterial hypertension. *Klinicheskaia Meditsina*, *85*(1), 31-35.

10. Zunnunov, Z. P. (2002). Basic etiological factors, pathogenetic mechanisms, and clinical forms of meteopathic reactions. *Voprosy Kurortologii, Fizioterapii, i Lechebnoi Fizicheskoi Kultury*, (6), 5-9.

11. Arseenkova, O. Yu., Vasil'ev, M. D., Tarkinskaya, D. Sh., Sulikova, R. Yu., & Mustafaev, I. M. (2021). Naselenie pozhilogo vozrasta v gruppe povyshennogo riska po zabolevaemosti melanomoi kozhi. *Kurortnaya meditsina*, (2), 19-25.

12. Zhalalova, G. T. (2011). Osobennosti izmenenii beloi i krasnoi krovi u lits pozhilogo i starcheskogo vozrasta v zavisimosti ot sezona goda. *Zdravookhranenie Kyrgyzstana*, (2), 237-240.

13. Belov, G. V., Kasymova, R. O., & Zheleznyak, A. U. (2015). Zabolevaemost' i smertnost' zhitelei g. Bishkek i g. Osh ot boleznei serdtsa i sosudov vo vremya zharkikh dnei i rezkikh smen pogody. *Meditsina Kyrgyzstana*, (3), 15-18.

14. Belov, G. V. (2021). Termodinamika. M.: Yurait, 248 s. (in Russian).

15. Belov, G. V., Subanova, A. A., & Seitov, T. S. (2018). Otsenka funktsionirovaniya zubochelyustnoi sistemy i svyazannykh s nei protsessov u lits molodogo, srednego i pozhilogo vozrasta zhitelei goroda Bishkek po domenam MKF. *Estestvennye nauki i meditsina: teoriya i praktika: Materialy V mezhdunarodnoi nauchno-prakticheskoi konferentsii*, 29-38.

16. Vorob'ev, A. E., & Abdinov, R. Sh. (2021). Vliyanie izmeneniya global'nogo klimata na rasprostranenie epidemii. *Vestnik Atyrauskogo universiteta imeni Khalela Dosmukhamedova*, *59*(4), 133-143. https://doi.org/10.47649/vau.2020.v59.i4.19

17. Aleksandrov, V. A., Shilova, L. N., Aleksandrova, N. V., Nikitina, N. V., & Aleksandrov, A. V. (2019). Effects of angiopoietin-like proteins types 3 and 4 on angiogenesis in patients with rheumatoid arthritis and osteoporosis. *Osteoporosis International*, *30*(S2), 727-728.

Список литературы:

1. Агаджанян Н. А. Адаптация и резервы организма М.: Физкультура и спорт, 1983.

2. Джуваляков П. Г. Влияние метеорологических и геогелиофизических факторов на смертность от ишемической болезни сердца в г. Астрахани: дисс. канд. мед. наук, Астрахань, 2002.

3. Сердюков А. Г., Винникова Ю. Г., Кульков В. Н. Динамика смертности населения Астраханской области: (Соц.-гигиен. исслед.). Астрахань, 1999. 174 с.

4. Ананикова В. В., Бонкало Т. И. Дезадаптивные переживания лиц пожилого и старческого возраста: преодоление одиночества в геронтологическом центре // Труды Научно-исследовательского института организации здравоохранения и медицинского менеджмента. 2021. С. 14-19.

5. Baker-Blocker A. Winter weather and cardiovascular mortality in Minneapolis-St. Paul // American journal of public health. 1982. V. 72. №3. P. 261-265. https://doi.org/10.2105/AJPH.72.3.261

6. Stott P. A., Stone D. A., Allen M. R. Human contribution to the European heatwave of 2003 // Nature. 2004. V. 432. №7017. P. 610-614. https://doi.org/10.1038/nature03089

7. Izzo Jr J. L., Larrabee P. S., Sander E., Lillis L. M. Hemodynamics of seasonal adaptation // American journal of hypertension. 1990. V. 3. №5. Pt. 1. P. 405-407. https://doi.org/10.1093/ajh/3.5.405

8. Jullien L., Gautier A. Hybrid fluorescent probes for imaging cellular proteins on demand // Medecine sciences: M/S. 2017. V. 33. №6-7. P. 576-578. https://doi.org/10.1051/medsci/20173306006

9. Zenchenko T. A., Tsagareshvili E. V., Oshchepkova E. V., Rogoza A. N., Breus T. K. On the issue of the effects of geomagnetic and meteorological activity on patients with arterial hypertension // Klinicheskaia Meditsina. 2007. V. 85. №1. P. 31-35.

10. Zunnunov Z. P. Basic etiological factors, pathogenetic mechanisms, and clinical forms of meteopathic reactions // Voprosy Kurortologii, Fizioterapii, i Lechebnoi Fizicheskoi Kultury. 2002. №6. P. 5-9.

11. Арсеенкова О. Ю., Васильев М. Д., Таркинская Д. Ш., Суликова Р. Ю., Мустафаев И. М. Население пожилого возраста в группе повышенного риска по заболеваемости меланомой кожи // Курортная медицина. 2021. №2. С. 19-25.

12. Жалалова Г. Т. Особенности изменений белой и красной крови у лиц пожилого и старческого возраста в зависимости от сезона года // Здравоохранение Кыргызстана. 2011. №2. С. 237-240.

13. Белов Г. В., Касымова Р. О., Железняк А. У. Заболеваемость и смертность жителей г. Бишкек и г. Ош от болезней сердца и сосудов во время жарких дней и резких смен погоды // Медицина Кыргызстана. 2015. №3. С. 15-18.

14. Белов Г. В. Термодинамика. М.: Юрайт, 2021. 248 с.

15. Белов Г. В., Субанова А. А., Сеитов Т. С. Оценка функционирования зубочелюстной системы и связанных с ней процессов у лиц молодого, среднего и пожилого возраста жителей города Бишкек по доменам МКФ. // Естественные науки и медицина: теория и практика: Материалы V международной научно-практической конференции. 2018. С. 29-38.

16. Воробьев А. Е., Абдинов Р. Ш. Влияние изменения глобального климата на распространение эпидемий // Вестник Атырауского университета имени Халела Досмухамедова. 2021. Т. 59. №4. С. 133-143. https://doi.org/10.47649/vau.2020.v59.i4.19

17. Aleksandrov V. A., Shilova L. N., Aleksandrova N. V., Nikitina N. V., Aleksandrov A. V. Effects of angiopoietin-like proteins types 3 and 4 on angiogenesis in patients with rheumatoid arthritis and osteoporosis // Osteoporosis International. 2019. V. 30. №S2. P. 727-728.

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