Patofiziologicheskie aspect ymetabolicheskogo sindroma (Pathophysiological aspects of metabolic syndrome) //*Lechebnoe delo* (General Medicine). – 2011.- № 4. – p. 4-10.

6. Romanova A.N. *Metabolichesky sindrom I koronrny ateroskleroz u zhitelei Yakutii* (Metabolic syndrome and coronary atherosclerosis in inhabitants of Yakutia) / Romanova A.N., Voevoda M.I., GolderovaA.S. // Newsletter of Siberian Branch, Russian Academy of Medical Sciences, 2011. – №5. –P.90-99.

7. Metabolichesky sindrom (Metabolic syndrome) / Edit. G. E. Roitberg. Moscow: MEDpressinform, 2007. – 224p.

8. Smetnik V.P.,Iliina L.M., NovikovaO.V. /SmetnikV.P.,Iliina L.M., NovikovaO.V.– Moscow: *Meditsina. Klimakteria* (Medicine. Change of life), 2006. –847 p.

9. Tsygankov B.D. *Psikhoterapevticheskaya korrektsiya psikhicheskikh narusheniy u zhenshchin v klimaktericheskom periode* (Therapeutical orrection of psychiatric disorders in climacteric women /Tsygankov B.D., Taritsina T.A. // Rossiisky meditsinsky zhurnal (Russian Open Medical Journal), 2007. – № 3. – P.27-29

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IMPACT OF COMORBIDITY ON METEOSENSITIVITY IN HYPERTENSIVE RESIDENTS OF THE REPUBLIC SAKHA (YAKUTIA)

ABSTRACT

Purpose. To study the correlation between severity of comorbidity and pathological meteosensitivity in the residents of the North with hypertension, as well as to evaluate some psychophysiological and biorhythmological factors that determine this correlation.

Materials and methods. 347 patients with hypertension - alien inhabitants of the North, men and women in the age - 20-65 years, examined and treated at the Clinic of the FSBSO Scientific Center Experimental and Clinical Medicine (Novosibirsk), residing in the North (the Republic of Sakha, Yakutia) were investigated. The method used was the collection of clinical data and evaluation of pathological disorders of the major functional systems of an organism, phychophysiological parameters, as well as the severity of pathological meteosensitivity using the original computer system of screening assessment of disadaptive, meteopathic and pathological conditions «SCREENMED».

Results. We described the most common pathological disorders at hypertension in the North: disorders of the endocrine system and metabolism; disorders of the sensory organs; of the central and peripheral nervous system; of liver. The association between the severity degree of comorbidity and the level of pathological meteosensitivity ($r = 0.41$, $p < 0.05$) was found. The growth of cognitive disorders, disorders of sensory-motor functions, attention and desynchronosis with the increasing degree of comorbidity was revealed.

Conclusion. The findings indicate that hypertension in alien inhabitants of the North is developing against the background of a pronounced degree of comorbidity. The correlation between severity of comorbidity at hypertension in the North and the level of pathological meteosensitivity, which is an important risk factor for hypertension in extreme environmental conditions is traced.

Keywords: comorbidity, North, hypertension, meteosensitivity, psychophysiological functions.

Hypertension is a major health and social problem in the world, representing the leading risk factor for cardiovascular morbidity and mortality [9, 10]. The greatest significance of the problem of prevention and treatment of hypertension acquires in the northern regions of Russia, which occupy nearly two-thirds of the country where two-thirds of its resource potential is concentrated [2]. It is in high latitudes where there are the highest morbidity and mortality rates from hypertension and pronounced features of the pathogenesis and course, associated with a reduction in human organism adaptive resistance to extreme weather and heliogeophysical factors [4, 2, 5].

Recently the issues of associated diseases, which are considered in the term of comorbidity, are becoming increasingly important in the internal medicine clinic. Comorbidity is defined as a combination of two and/or more syndromes or diseases, pathogenetically interconnected or overlapping in time in the same patient, regardless of the activity of each [1].Among those persons with comorbidity higher mortality rates, higher risk of hospitalization, lower quality of life and reduced functional possibilities are registered [1]. Of particular importance in the formation of co-morbidity are disorders of the cardiovascular system, which are not only naturally, drawn up in the form of cardiac pathology, but also determine the further development of diseases (disorders, pathology) of other physiological systems, since it is the cardiovascular system that provides normal activity of all other systems of an organism. At present, the study of comorbidity prevalence in the middle and high latitudes, depending on gender, age and socio-economic characteristics is actively carried out [6]. However, the questions of relationship between comorbidity in hypertension and disorders of human adaptation to the specific environmental conditions of the North remain unexplored.

Previously, it has been found that the most important factor in the development of hypertension in the North is an increased and / or pathologically changed meteosensitivity (pathological meteosensitivity) [8]. Pathological meteosensitivity is one of the most important manifestations of the human organism disadaptation to the natural conditions [3, 11] and is defined as the organism's ability to respond to changes in climatic, meteorological and heliogeophysical factors in the form of development of pathological meteopatic reactions [3]. Despite of its

important role in the development of pathology, the questions of relationship between comorbidity and pathological meteosensitivity in hypertension in the North remain unexplored.

The aim of the study was to investigate the relationship between comorbidity and pathological meteosensitivity in the residents of the North with hypertension, as well as assessment of some psychophysiological and biorhythmological factors that determine this relationship.

OBJECT AND METHODS

347 patients with hypertension - alien inhabitants of the North, men (n = 165) and women (n = 182) in age - 20-65 years with a mean age of 44.2 ± 0.5 years, having been examined and treated on the basis of Clinic of the FSBSO Scientific Center Experimental and Clinical Medicine (Novosibirsk), residing in the North (the Republic of Sakha, Yakutia), were investigated. The study was conducted in accordance with the Helsinki Declaration (in the revision of the 41st World Medical Assembly, 1989).

Verification of diagnoses of the surveyed persons was carried out with the use of modern methods of clinical, functional and laboratory diagnostics. For study, the method of collection of clinical data and evaluation of pathological disorders of the major functional systems of an organism, as well as evaluation of the severity of pathological meteosensitivity using the original computer system of screening assessment of disadaptive meteopathic and pathological conditions "SCREENMED" (N of state registration - 970035 from 29.01.1997), was used. Also statistical analysis of medical documentation was conducted. All identified diagnoses in the form of clinical entities were taken into account.

Assessment of comorbidity was conducted by the conventional method of measuring comorbidity - CIRS system - the cumulative scale rating diseases (Cumulative Illness Rating Scale) [7]. Psychophysiological functions were determined according to assessment of the totality of the psychophysiological tests, included in the computer system "SCREENMED". Proofreading test using Anfimov`s table, analysis of duration and variability of the latent periods of simple sensory-motor reactions; test to determine the accuracy of subjective perception and playback of time intervals (individual minute test) were conducted.

Statistical processing of the data was performed using STATISTICA (StatSoft, USA) software package version 7.0. For comparison the average values, for a normal distribution, paired Student's t test (t) was used. When the distribution did not meet the criteria of normality, nonparametric U-test of Mann-Whitney was used. For multiple comparisons correction of Bonferroni was applied. Correlation analysis was performed using Pearson's parametric test for a normal distribution and Spearman nonparametric test when normal distribution was not observed. Differences were considered statistically significant at $p < 0.05$.

Table 1

Indicators of adaptive capacity, in hypertensive patients with different degrees of comorbidity (M ± m)

	Low degree of comorbidity (0-18) (n=46)	Moderate degree of comorbidity (19-37) (n=216)	High degree of comorbidity (38 and more points) (n=85)	P
Pathological meteosensitivity, point	1.58±0.19	2.55±0.09	3.37±0.12	1-2=0.000013; 1-3=0.000000; 2-3=0.000001
LP SSMR of right hand, msec	204.6±5.7	219.4±2.6	220.2±3.6	1-3=0.01
LP SSMR of left hand, msec	202.8±6.3	211.2±2.7	211.7±4.1	
Proofreading test, points	9.5±0.4	8.3±0.2	7.7±0.3	1-3=0.002
Individual minute, sec	49.6±3.3	45.2±1.2	42.1±1.9	1-3=0.03
Synchronization of endogenous and exogenous rhythms, points	6.1±3.9	4.8±3.6	4.4±3.9	1-3=0.02

Note: LP SSMR - latent period of simple sensory-motor reaction.

Table 2

Indicators of adaptive capacity, in hypertensive patients with different degrees of comorbidity (M ± m)

	Low degree of comorbidity (0-18) (n=46)	Moderate degree of comorbidity (19-37) (n=216)	High degree of comorbidity (38 and more points) (n=85)	P
Pathological meteosensitivity, point	1.58±0.19	2.55±0.09	3.37±0.12	1-2=0.000013; 1-3=0.000000; 2-3=0.000001
LP SSMR of right hand, msec	204.6±5.7	219.4±2.6	220.2±3.6	1-3=0.01
LP SSMR of left hand, msec	202.8±6.3	211.2±2.7	211.7±4.1	
Proofreading test, points	9.5±0.4	8.3±0.2	7.7±0.3	1-3=0.002
Individual minute, sec	49.6±3.3	45.2±1.2	42.1±1.9	1-3=0.03
Synchronization of endogenous and exogenous rhythms, points	6.1±3.9	4.8±3.6	4.4±3.9	1-3=0.02

Note: LP SSMR - latent period of simple sensory-motor reaction.

RESULTS AND DISCUSSION

The average index of comorbidity (by the CIRS system) for the total sample was 29.6 ± 0.5 points, in men – 27.0 ± 0.7 points, in women – 32.1 ± 0.7 points. The most common were combinations of hypertension with disorders of the endocrine system and metabolic disorders - 92.5%; disorders of the sensory organs - in 83.5%; disorders of the central and peripheral nervous system - 78.1%; disorders of liver - in 76.9% (Table 1.).

An index of pathological meteosensitivity in the sample was 2.6 ± 0.07 points, in men – 2.3 ± 0.10 points, in women – 2.8 ± 0.10 points.

To solve the main objective of the study, all patients were divided into 3 groups depending on the degree of comorbidity (by CIRS): Group 1 – low degree of comorbidity (0-18 points) (n = 46); moderate degree of comorbidity (19-37 points) (n = 216) and high degree of comorbidity (38 points or more) (n = 85). An analysis of severity of pathological meteosensitivity in hypertensive patients with different degrees of comorbidity was carried out. An increase in pathological meteosensitivity with increasing degree of comorbidity was revealed (Table. 2).

The correlation analysis showed a statistically significant ($p < 0.05$) relationship between the degree of comorbidity (by CIRS) and the level of pathological meteosensitivity ($r = 0.41$).

Previously, the importance of psychophysiological and biorhythmological mechanisms in the development of pathological meteosensitivity was established [8]. We have studied a number of indicators that characterize the physiological and biorhythmological functions important in the process of organism's adaptation to the environment, in the hypertensive residents of the North with different degrees of comorbidity. Analysis of psychophysiological indicators characterizing the cognitive and sensory-motor functions, in the hypertensive residents of the North with different degrees of severity of comorbidity, showed a decline in sensory-motor speed of response, increase in inhibitory processes in the central nervous system, reduction in the productivity of attention and deterioration of cognitive processes among hypertensive residents of the North with increasing degree of comorbidity. Hypertensive patients with high degree of comorbidity showed significantly higher rates of latent periods of simple sensory-motor reaction of the right hand, and significantly lower rates of proofreading tests than in patients with low degree of comorbidity (Table. 2).

Taking in consideration an important role of the temporal organization of an organism and its synchronization with external factors in the processes of adaptation to the environment [8] it seems to be important to investigate the integrated indicators, characterizing the severity of chronobiological disorders in the examined persons. Analyzes of biorhythmic characteristics in the selected groups have showed that patients with high degree of comorbidity have a higher degree of desynchronosis, than patients with low degree of comorbidity. Hypertensive patients with high degree of comorbidity have a statistically significant lower rates of synchronization of endogenous and exogenous rhythms and duration of individual minutes as compared to hypertensive patients with low degree of comorbidity (Table. 2).

CONCLUSION

The present study has revealed that hypertension in alien inhabitants of the North is developing against the background of a pronounced degree of comorbidity. The association between severity of comorbidity at hypertension in the North and the level of pathological meteosensitivity is traced. The relationship of comorbidity and pathological meteosensitivity may be mediated by the disorders of psychophysiological and biorhythmological organism's functions important in the processes of adaptation to the natural conditions of the North. Pathological meteosensitivity, in its turn, as have been shown previously [8], is an important risk factor for hypertension in the North.

REFERENCES

1. Belyalov F.I. Lechenie vnutrennih boleznei' v uslovijah komorbidnosti [Treatment of internal diseases in terms of comorbidity]. Irkutsk, 2011, 305 p.
2. Gapon L.I. Shurkevich N.P. Vetoshkin A.S. Gubin D.G. Arterial'naja gipertonija v uslovijah Tjumenskogo Severa. Desinhronoz i giperreaktivnost' organizma kak faktory formirovanija bolezni [Hypertension in Tyumen North. Desynchronosis and hyperreactivity of the organism as factors of disease formation]. M: Medicinskaja kniga, 2009, 208 p.
3. Grigoryev K.I. Meteoprofilaktika v pediatrii [Meteoprevention in pediatrics]. M.: Izdat. Dom «Russkii' vrach», 2010, 116 p.
4. Zapesochnaya I.L. Avtandilov A.G. Zapesochnaya I.L. Osobennosti techenija arterial'noi' gipertonii v severnyh regionah strany [Features of hypertension in the northern regions of the country]. Klinicheskaja medicina, 2008, V. 86, №. 5, PP. 42-44.
5. Mataev S.I. Vasilkova T.N. Metabolicheskii' sindrom na Krai'nem Severe [Metabolic syndrome in the Far North]. Tyumen: BIK TjumGNGU, 2011, 132 p.
6. Nikolaev Yu.A. Sevostyanova E.V. Mitrofanov I.M. Polyakov V.Ya. Dolgova N.A. Osobennosti polimorbidnosti u pacientov terapevticheskoi' kliniki kardiologicheskogo i gastroenterologicheskogo profilja [Features of polymorbidity in cardiac and gastroenterological patients from a therapeutic clinic]. Terapevticheskii' arhiv, 2016, №1, PP.40-45.
7. Blood pressure control and knowledge of target blood pressure in coronary patients across Europe: results from the EUROASPIRE III survey /C. Prugger, U. Keil, J. Wellmann [et.al.] //J. Hypertens. – 2011. – Vol. 29. – N 8. – PP. 1641-1648.
8. Hasnulin V.I. Northern cardiometeopathies / V.I. Hasnulin, A.V. Hasnulina, E.V. Sevostyanova. - Novosibirsk, 2004. - 220 p.
9. How to measure comorbidity: a critical review of available methods / V. De Groot, H. Beckerman, G. Lankhorst [et al.] // J.Clin.Epidemiol. – 2003. - № 56. – PP. 221-229.
10. Hypertensive in Russia are interested in a healthier lifestyle: results of the RELIF multicenter study / R.G. Oganov, S.N. Pogosova, I.E. Koltunov [et.al.] //Eur. J. Cardiovasc. Prev. Rehabil. – 2011. – Vol. 18, № 2. – PP. 224-232.
11. Yackerson N.S. Possible effects of changes in the meteorological state over semi-arid areas on the general well-being of weather-sensitive patients /N.S. Yackerson, L. Bromberg, B. Adler, A. Aizenberg //Environ. Health. – 2012. – № 11. – P. 26.

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FEATURES OF THE CENTRAL NERVOUS SYSTEM PATHOLOGY IN CHILDREN AND ADOLESCENTS OF THE MIRNYJ REGION THE REPUBLIC SAKHA (YAKUTIA)

ABSTRACT

We present results of an analysis of chronic diseases of the central nervous system in children and adolescents in the region of Mirnyj in Yakutia. The pathology of the nervous system of the underlying disease was 34.8%. A high percentage of CNS pathology in children from an early age indicates that it is a consequence of undergoing intrauterine hypoxia on the background of the pathological course of pregnancy.

Keywords: central nervous system, children, adolescents.

INTRODUCTION

The document " The national strategy of actions in the interests of children for years 2012 - 2017 " determines the measures on development of healthy way of life, realization of monitoring of the life's quality of children, including emotional, communicative and psychosomatic components, the warning of emergence and/or distribution of diseases, early detection, involving of the health care technologies, effective organizing and medical technologies, technologies of complex diagnosis and early medical-and-social help to the children with rejections in development and health [5]. The state of health of children's population today is one of main directions of social politics in our country. The importance of realization of this statue is determined by the following: the health of children largely is the integral indicator of the health quality, the fundamental basis for the formation of the health potential of adult members of society, because the number of population able to work is being reduced. The analysis of child morbidity according to the official statistics in 2006-2015 testifies that the children's health continues to deteriorate [1, 4]. During the last five years the frequency of the pathology of diseases of the nervous system is increased significantly [1, 2]. Depending on the number (specific weight in population) of children with damage of central nervous system, with disabilities in intellect and behavior, the intellectual potential of the future society is being defined [1,3,4].

Study purpose: to analyze the frequency of pathology of the Central nervous system being occurred at children and adolescents in region Mirnyj (Yakutia).

MATERIALS AND METHODS

In the special children's hospital departments in Novosibirsk 2875 children living in region Mirnyj (Yakutia) in age of 1 month up to 17 years are examined and treated. The research was performed in compliance with consent of children and their parents and with the permission of the Committee of Ethics, in accordance with the standards of ethics of the Helsinki Accord (adopted at the 59th WMA General Assembly, Seoul, 2008). The research was carried out under the contract with the Ltd Society "ALROSA" for the period from 1993 till 2015.

The complex examination of children included: complaints, data of anamnesis, date of survey of parents and children, the study of personal medical records, physical examination, results of EEG, REG, M-ECHO of brain, MRT of brain, X-ray of skulls in two projections , X-ray of cervical spine with functional tests, assessment of ocular fundus, ECG, ECHO - KG, ultrasound examination of abdominal organs, ultrasound examination of pelvic organs, assessment of the vegetative nervous system, assessment of the conjunctive tissue. Along with the above mentioned complex study the specific examinations were performed in compliance with the each type of pathology. The psychometric study included the questionnaires of children and their parents with the use of validated Russian versions of several questionnaires (assessment of personal, social, psychological, mental health and quality of life).

The verification of the clinical diagnosis was carried out on the base of the results of the patients' assessment. According to the standardized classification of ICD - X revision the primary and associated diseases were diagnosed to each child. The underlying disease was accepted as that one, which is characterized by the most serious changes of any system and might result in chronic illness and disability of the child. The statistical software package "Statistica 6" was used for the statistical processing of the study results.

RESULTS AND DISCUSSION

2 875 people in age of 1 month till 18 years were surveyed and treated in specialized departments of the children's clinics in Novosibirsk during the period of 1993-2015.

All the children were accepted after the selection at the place of residence. The children of town Mirnyj accounted for 72.2%, of the Mirnyj's villages (Udachny, Aikhal, Arylakh, Chernyshevsky, Almazny, Svetly, etc.) - for 27.8 percent. The analysis of the distribution of children as to the social status of parents showed that children of employees in the Mirnyj region is accounted for 58.9%, children of workmen 41.1, the majority of children living in the Mirnyj's villages – they are children of workmen