

INFLUENCE OF METEOROLOGICAL CONDITIONS ON THE LEVEL OF POLLUTION OF THE AIRALE TERRITORIES

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Abstract

The concept of risk assessment is currently considered in most countries of the world as the main mechanism for the development and adoption of managerial decisions at all levels of public health protection. The concept of risk assessment is based on determining the individual and collective (population) risk of a pathological condition under the influence of adverse environmental factors [1, 2]. In modern conditions, public health directly depends on the safety of the environment and the level of disease prevention.

The activity of a modern person is carried out in conditions of an increase in the intensity and duration of the action of adverse environmental factors. The combination, simultaneous or sequential action of several factors leads to a mutual burdening of their influence on the human body, causing a rapid depletion of human physiological reserves. In response to the effect of a certain dose (intensity and duration) of unfavorable factors, states of extreme stress of adaptation mechanisms with reversible phenomena of maladjustment can develop [3].

Environmental safety is the levels of exposure to environmental factors that are safe for human health, that is, they violate the homeostasis of the functional systems of the body. The analysis of associative relationships between the content of metals and homeostatic indicators of the most sensitive systems of the body showed that for a safe and normal state of indicators of blood, biochemical metabolism, immunity, upper limits of the environmentally safe content of metals in human blood can be proposed.

Keywords: influence, meteorological, conditions, level, pollution, air ale, territories,

INTRODUCTION

Natural and climatic conditions continue to be the most important among the environmental factors, largely determining the comfort of a person's life throughout his life. The possibilities for sustainable development of the human community are inextricably linked with climate sustainability. The dependence of ecological, social, economic and technological processes on climatic and, in particular, hydroclimatic conditions is obvious. In the formation of the latter, a huge role belongs to the water factor, which determines the possibilities of life support and progressive development of modern and future generations. This is what testifies to the importance of assessing current and forecasting future changes in water resources. Global climate changes play a dominant role in this [4,5].

A person and his environment (natural, industrial, urban, household and others) in the process of life constantly interact with each other, the excess of the usual levels of interaction is accompanied by negative impacts on

humans or the natural environment. The balance in the system "man - environment" depends on the temperature of the environment, mobility and relative humidity of air, atmospheric pressure, therefore, it is necessary to maintain such a ratio of physiological and physicochemical processes, which would maintain a stable state of the organism [6,7]. High anthropogenic load, emissions of pollutants into the atmosphere are the reason for the contamination of the district's soil, agricultural lands with various pollutants, including the 1st and 2nd hazard classes. Dangerous levels of soil pollution are determined by excess concentrations of lead, copper and zinc, which indicates a significant accumulation of toxic substances in the soil cover.

Anthropogenic pollution entering the soil accumulates in it, exhibits the effect of summation by the type of potentiation and synergy, contributes to the appearance of secondary products, which in some cases may be more toxic than their initial components [8,9,10]. Pollution of the atmosphere to the greatest extent depletes the

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adaptive capabilities of the human body. But, despite this, the atmosphere has a powerful ability to self-purify from pollutants. Air movement disperses impurities. Dust particles, gases and other substances fall out of the air onto the earth's surface under the action of gravity and rain flows [11,12,13]. Chemical substances in the air have a damaging effect on the mucous membranes and the local immunity system, which increases the risk of developing chronic organ pathology [14,15,16]. The Aral Sea crisis is the most striking example of an environmental problem with serious socio - economic consequences, with which all the states of Central Asia are directly or indirectly connected. The crisis situation caused by the drying up of the Aral Sea has developed as a result of the agrarian orientation of the economy based on the development of irrigated agriculture and an increase in the volume of irrevocable water consumption for irrigation. Consequently, the increasing requirements for the qualitative and quantitative assessment of the components of the natural environment determine the relevance of the study of the spatial and temporal distribution of the climatic indicators of the study area, since the climatic-ecological state of the place of permanent residence of a person largely determines the aspects of his life. To characterize climatic conditions, from the standpoint of maintaining human health, it is necessary to determine the level of climate discomfort, because the question of human health in the third millennium is increasingly developing into a problem of the future. The obtained schemes of the spatial distribution of climatic indices (indicators) in the study area allow to informatively and visually display the calculated data obtained as a result of analysis and synthesis.

Fundamental hygienic research has acquired a new direction - the identification of quantitative relationships between changes in environmental factors with the characteristics of health disorders of the population at the pre-pathological and pathological levels of the body [17]. Intense and long-term exposure to environmental factors on the human body causes the appearance of prenosological and premorbid conditions, which differ from both the norm and pathology. These states arise in the process of adaptation of the organism to environmental conditions, as a result of tension in the mechanisms of regulation and depletion of the reserve capabilities of the organism. In response to the action of an irritant in a healthy person, a prenosological state develops during the transition from the state of the maximum permissible stress of compensatory reactions, which ensures the preservation of homeostasis, to the state of maladjustment, in which life-threatening syndromes or critical conditions develop.

Therefore, the development of means and methods for the correction of prenosological conditions is an important section of preventive medicine. Studies of the health status of the population indicate the presence of regional characteristics determined by the relationship between man and the ecology of the environment [18, 19, 20, 21, 22, 23]. In recent years, in all countries of the world, environmental problems have attracted the attention of a significant number of scientists and researchers, as well as health workers. Diseases in one way or another associated with ecology, that is, caused by certain parameters of the human environment, can be represented by two groups. The first includes environmentally related diseases - human diseases that

constitute the etiology of the disease. These include endemic diseases; due to radiation exposure; chemical poisoning by emissions into the environment; diseases caused by exposure to biological allergens.

The second group is made up of the most numerous environmentally dependent diseases - diseases of a nonspecific nature that arise against the background of a significantly changed external environment. At the same time, environmental causes act as starting pathogenetic mechanisms of pathology: an increase in the general morbidity of the population: increased child morbidity; an increase in the frequency of pregnancy pathology; an increase in the frequency of violations of intrauterine development of the fetus; an increase in cancer incidence, etc. [24, 25, 26, 27].

The purpose of the present study was the assessment of regional natural and climatic factors of the territories of Arys, Shalkar, Yrgyz, Atasu and Ulytau, taking into account the zoning of the residential zone. assessment of the informative value of the vegetative status and hemodynamic parameters in the adult population living in the zone of the ecological pre-crisis state of the Yrgyz settlement.

MATERIALS AND METHODS OF RESEARCH

The work was carried out within the framework of the scientific and technical program of the Ministry of Health of the SR RK on the topic: "Comprehensive approaches to the management of the health status of the Aral Sea region" (2014-2016). In the course of the study, the following were used: the method of measuring climate parameters, the coordinates of the sampling points (latitude, longitude) - standardized. The research was carried out in the cold and warm period of the year, around the clock every 3 hours in Arys at 28 points, Shalkar at 14 points, Yrgyz at 13 points, Atasu at 11 points, at 8 points in Ulytau. Maintenance equipment: GPS - navigator, meteorological station GEOS No. 11, Meteometer MES-200 A, computer program Microsoft Excel 2007. The results of the study were subjected to statistical processing using the statistical software package "Statistica 10.0".

RESEARCH RESULTS

Analysis of retrospective data from the regions of Aktobe (Shalkar, Yrgyz settlement), South Kazakhstan (Arys) and Karaganda (Atasu and Ulytau villages) regions for 2004-2014 showed that the weather in the studied territories was characterized by instability, due to high temperatures (exceeding the norm): from 0.7 to 36.7 ° C in the cold season, from 0.8 to 11.8 ° C in the warm season and heavy precipitation: from 1.6 to 60 mm in the cold season, from 6.7 to 85 mm in the warm season. Sharp climatic changes in the studied regions were noted mainly in January and July. Climatic indicators of Shalkar, Yrgyz, Ulytau and Atasu in the cold season are characterized by temperature drops (from 4 ° C to -20 ° C) and air humidity (58 - 100%) with winds from east, north-east and southern directions at a speed of 1 to 8 m / s, which corresponds to a sharply continental climate. The climate of the cold season of the city of Arys is expressed by a change in temperature (from 4 ° C to -6 ° C), high parameters of air humidity (62 - 98%) with winds of the south-east, west and south-west directions with a wind speed of 1 to 5 m /from. On the territory of Shalkar, during the cold period of the year, the average air temperature decreased by 3.9 ° C from the climatic

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norm, which increased the continentality of the climate. The climate parameters of the warm season in Shalkar, Yrgyz, Ulytau and Atasu are expressed in a sharp change in daily temperature (from 2 ° C to -26 ° C) and air humidity (24 - 94%) with winds from the west and southwestern directions at a speed of 1 to 10 m / s, which is due to the sharply continental climate of the studied territories. In the warm period of the year, the climate of the city of Arys was characterized by temperature drops (from 14 ° C to 35 ° C), fluctuations in air humidity (13 - 79%) with northeastern winds with a wind speed of 1 to 4 m / s. Zhanaarka, Ulytau, Shalkar, Yrgyz and Arys districts are classified as territories with low technogenic load with an emission load factor of 0.047; 0.06; 0.023; 0.006, 0.008 t / person.

Numerous studies confirm that the main weather parameters, on which the accumulation of pollution in the surface layer of the air of cities and towns depends, are temperature, speed and direction of winds. Annual fluctuations and features of the spatial distribution of atmospheric pollution depend on the synoptic conditions formed in the territories of the Republic of Kazakhstan. Therefore, it is necessary to determine the intensity of dispersion and the accelerated development of the processes of anthropogenic load on the environment of the studied regions. The city of Shalkar is the regional and administrative center of the Shalkar district of the Aktobe region. The area of the Shalkar region is 61.9 thousand km². The population of the Shalkar region is 46 thousand people. The main branches of the economy of the Shalkar region are agricultural production. Agricultural products by 38.2 percent are represented by crop production, 61.6 percent - by livestock. Gross agricultural production in 2013 (in current prices) amounted to 9053.4 million tenge, which is 0.9 percent more than in 2012, including crop production - 3462 million tenge, livestock - 5581.2 million tenge. In the region, meat production for 2013. amounted to 4.2 thousand tons and increased compared to 2012. by 4.2 percent, milk - 13.1 thousand tons and more by 0.5 percent. As of January 1, 2014, 219 economic entities are registered in the district, of which 190 are operating. Industrial production volume in 2013 amounted to 11469 million tenge and decreased by 5.3 percent compared to 2012. The main types of manufactured industrial products: building stone, pebbles, gravel, crushed stone, meat, milk. The city of Shalkar is the regional and administrative center of the Shalkar district of the Aktobe region. The area of the Shalkar region is 61.9 thousand km². The population of the Shalkar region is 46 thousand people. In the Shalkar region at the beginning of 2013-2014. there are 37 daytime general education schools with 7850 students. The village of Irgiz is the regional and administrative center of the Irgiz district of the Aktobe region. The area of the Irgiz district is 41.5 thousand square meters. km., which is home to 15.2 thousand inhabitants. As of January 1, 2014, 135 economic entities are registered in the district, of which 130 are operating. Industrial production volume in 2013 amounted to 801.1 million tenge and increased by 0.4 percent compared to the previous year. The main types of manufactured industrial products: meat, milk, bread. The main direction of the economy of the Irgiz region is agricultural production. Agricultural products are 37.8 percent represented by crop production, 62 percent - livestock, mainly sheep. In the village of Irgiz there are 3 bakeries, a workshop for the production of

mineral waters, a road construction department and LLP-21. Gross agricultural production in 2013 amounted to 7021.7 million tenge, which is more than in 2012. by 4.8 percent, including crop production - 2657.6 million tenge, livestock - 4357.5 million tenge. In the region, meat production for 2013. amounted to 3.4 thousand tons and increased by 9.2 percent compared to 2012, milk - 9.4 thousand tons and 1.3 percent. In the Irgiz region at the beginning of 2013-2014. educational organizations represent 22-day general education schools, where 3082 students study. The city of Arys, as a station, which is called the gateway to Central Asia, was founded at the beginning of the 20th century during the construction of the Turksib railway. Today Arys with a rural area is a city of regional subordination, the largest junction station, with three directions, connecting the European part of Russia and Siberia with Central Asia and Kazakhstan. The region includes 6 rural districts. The administrative center is the city of Arys.

The population is 67,122 people. The area of the district is 6300 square kilometers. In the city of Arys are concentrated repair and locomotive enterprises serving the railway industry (sleepers impregnating plant, repair and locomotive depots, track enterprises, etc.). The main directions of agricultural production are the production of meat, milk, growing raw cotton, vegetables and melons. The main general industry in Atasu and Ulytau is agriculture, in particular - wheat cultivation, cattle breeding, in addition, these settlements have enterprises serving the needs of the railway, enterprises of construction services. On the territory of Zhanarka region, iron ore mining for metallurgical plants, as well as the commissioning of the Atasu-Alashankou oil pipeline (2006), which is designed to transport oil to Alashankou (China), with a total length of 962.2 km, and a diameter of 813 mm.

The industry of the Ulytau region is represented by mining and processing industries, distribution of electricity and water. Large and medium-sized industrial enterprises include Orbatas LLP, Aktas LLP, Karsakbay Metallurgical Plant under the Kazakhmys Corporation, Ulytau KGP, Zhezbulak KGP.

For the period from 2008 to 2012, the volume of industrial production of the district decreased from 897.6 to 393.0 million tenge, or by 44%. The physical volume in 2009 increased by 105%. In the city of Shalkar, there are 2 hospitals (regional, maternity hospital), 2 dispensaries (anti-tuberculosis, neuropsychiatric) and 3 polyclinics, 1 district department for consumer protection. In Irgiz settlement, healthcare organizations are represented by 1 hospital and 1 polyclinic. Educational organizations are represented by 4 general education, 1 sports and 1 music schools. In the city of Arys, there are 2 hospitals (district, maternity hospital), 2 dispensaries (anti-tuberculosis, neuropsychiatric), 1 ambulance station and 3 polyclinics, 1 district department for consumer protection. Educational organizations are represented by 11 schools and 15 kindergartens.

The health care system in Atasu is represented by 1 hospital (district) and 1 polyclinic. Educational organizations are represented by 4 schools, 1 college and 4 kindergartens. In recent years, there has been a tendency for the growth of vehicles in the Karaganda region. According to the Traffic Police Department, in the first half of 2010 the number of vehicles (buses, trucks, cars) amounted to 89,900 units, in the reporting period of 2011 their number increased to 90,898 units (i.e., by

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1.2%). The volume of emissions from vehicles in the first half of 2011 amounted to 20.19 thousand tons (63.3% of the gross emissions). In 2010, the volume of vehicle emissions was 19.92 tons, i.e., in 2011 an increase of 0.27 thousand tons (1.33%).

Since the studied regions are agricultural, the main role in the pollution of the atmosphere of Shalkar, Irgiz, Arys, Atasu and Ulytau is played by motor vehicles. Emissions from vehicles in summer are over 50% of the total amount of emissions per annum. The main "contribution" to atmospheric air pollution in the cold season of the city of Shalkar, the settlement of Irgiz, the city of Arys, the settlement of Atasu and the settlement of Ulytau is made by boiler houses of private residential sectors and administrative and economic and other organizations of regional significance with autonomously heated boilers on solid fuels (coal). According to the data provided by the State Institution "Department of Ecology in the Aktobe Region of the Committee for Environmental Regulation and Control of the Ministry of Environmental Protection of the Republic of Kazakhstan", the average annual volume of emissions of pollutants into the air in the Shalkar region in 2012 increased significantly compared to previous years and amounted to 2 642.831 tons / year, in the Irgiz region - 108.89 tons / year, and in 2013 - 110.86 tons / year (Table 27).

According to the State Institution "Department of Ecology in the South Kazakhstan region of the Committee for Environmental Regulation and Control of the Ministry of Environmental Protection of the Republic of Kazakhstan", the average annual volume of emissions of pollutants into the air in the territory of Arys in 2013 increased and amounted to 912.338 tons / year. According to the State Institution.

"Department of Ecology for the Karaganda Region of the Committee for Environmental Regulation and Control of the Ministry of Environmental Protection of the Republic of Kazakhstan", the maximum average annual volume of emissions of pollutants into the air in the Zhanaarka region was recorded in 2013 and amounted to 2,496.866 tons / year. An increase in atmospheric air pollution in the Ulytau region was noted in 2013 with the total emissions of 4,630, 182 tons / year.

Calculation of the emission load factor and the relative risk of the impact of chemical pollution on the population of the studied territories, except for the Ulytau region, showed that, in general, the situation is quite natural, due to the absence of industrial enterprises in the studied territories that pollute the atmospheric air, the emission load factor and the relative risk of the impact of chemical pollution on the population of the studied territories is low (table 2). Based on the ranks of the technogenic load (high, increased, medium, low), the studied territories are classified with a reduced technogenic load (rank - 4; E = 0.52; 0.07; 0.15; 0.75). The main "contribution" to air pollution in Aralsk, Aiteke-bi, Zhosaly, Zhalagash and Shieli is made by stationary (solid fuel boiler houses) and mobile (motor transport) sources of pollution, and the absence of large industrial centers determined a low technogenic load. Table 2 - Coefficient of emission load and the relative risk of the impact of chemical pollution on the population of the Aral Sea region

According to the calculation of the emission load factor and the relative risk of the impact of chemical pollution on the population of the Ulytau region showed that the region belongs to the territory with a high rank of technogenic load (rank - 4; E = 3.39), since the Ulytau

region includes the territories of enterprises polluting the atmospheric air of the mining and manufacturing industries. A characteristic feature of the climate of the studied territories is the high frequency and duration of dust storms, which, at high wind speeds, increase air pollution in the studied settlements. Dust pollution of the atmosphere of Shalkar in summer occurs mainly during dry periods, when dry winds with dust storms often occur. In the summer in Shalkar, the amount of dust increases, which is due to the fact that it enters the atmospheric air from the underlying surface, since the territory is composed of sands and soils of light texture and from the bottom of the dried-up sea, which are involved in wind transport, especially when the speed of the southern winds increases. and southwest directions during the absence of rain. On the territory of the studied region, there is a sharp change in winter and summer weather regimes. At this time, wind activity is most actively manifested, under the influence of which the processes of soil deflation develop. Most of the Aral Sea area is composed of sands and soils of light texture, which are involved in wind transport.

CONCLUSIONS

Thus, the atmospheric air of the cities of Shalkar, Arys and settlements - Irgiz, Atasu, due to the lack of industrial enterprises, is less polluted with various chemical substances. The main air pollutant in the studied settlements is motor transport, the share of which, especially in the warm period, reaches more than 50%, in addition, the unfavorable ecological situation of the studied territories of the Aral Sea region is the result of the interaction of unique natural-climatic (uncomfortable) factors and intensive human activities. The natural and climatic features of the territories of settlements in the Aral Sea region are determined, due to the geographical location and environmental problems, which made it possible to distinguish changes in the weather characteristic of the territories of the Aral Sea region. Atasu and Ulytau can be used for further development of programs aimed at creating a favorable climate for living in the Aral Sea region.

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