

ENVIRONMENTAL PROBLEMS OF WATER SUPPLY OF THE POPULATION OF THE SOUTH ARAL SEA REGION AND PROTECTION OF WATER RESOURCES

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ABSTRACT: In the article the questions of study and estimation of ecological risk are examined for water ecosystems in the region of Southern Aral Sea region. Methodological bases of estimation of stability and ecological prosperity of water objects are related to the decision of problem of quantitative description of large number of processes, qualificatory properties of ecosystems.

KEYWORDS: South aral sea region, Water ecosystems, Stability, Ecological prosperity.

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I. INTRODUCTION

Currently, under the increasing influence of the anthropogenic factor on water resources, the allocation of priority tasks in the field of water resources protection and their rational use is becoming especially urgent [9,10]. Particular importance in this context are the various aquatic ecosystems, which are the objects of multi-purpose use, including those used for drinking water supply, as a result of which there is a need to combine multidirectional tasks of water resources use. At the same time, solving problems of protecting water resources and rational water use is impossible without studying the features of the functioning of these ecosystems, which may depend on the impact of various environmental factors, in particular anthropogenic.

Water resources of the South Aral Sea region play a significant factor determining the sustainability of ecosystems. Most environmental indicators characterizing the state of water resources indicate a decrease in its regulatory potential.

The development of irrigated agriculture in the Amudarya basin has led to a 4-fold decrease in the flow of water to the delta compared to the natural regime. The mineralization indices sharply increased and the quality of drinking water deteriorated [3]. The decrease in the quantity and quality of surface water has led to the depletion of freshwater underground lenses. Some of the previously exploited groundwater deposits ceased to meet the requirements of drinking water supply for the population of the South Aral Sea region and, in particular, the Republic of Karakalpakstan [9].

The main objective of the study is to identify the main trends in the development of environmental problems of drinking water supply and its impact on the health status of the population of the South Aral Sea region, to analyze the quality of drinking water and outline the main solutions to the problems of providing the population with quality drinking water.

II. MATERIAL AND METHODS

The main source of information was data on contamination of drinking water from 2010 to 2019, provided by the Committee on Ecology and Environmental Protection of the Republic of Karakalpakstan, the Tuyemoyun-Nukus

Regional Administration and the Karakalpakstan Republican Center for State Sanitary and Epidemiological Control of the Ministry of Health of the Republic of Uzbekistan.

To determine the incidence rates, we used the method of medical statistics based on materials on treatment. The reporting data of the Organizational and Methodological Department of the Ministry of Health of the Republic of Karakalpakstan and the Ministry of Economy of the Republic of Karakalpakstan were used. All calculations during the study were performed using a package of applied biomedical programs.

III. RESULTS AND DISCUSSION

The conducted environmental assessment of the environment in the South Aral Sea region shows that the main trends in environmental destabilization are continuing and there is a threat to the health status of the population living in this territory. The development of criteria for assessing the health status of the population in order to conduct scientifically-based comprehensive measures to reduce the overall incidence is particularly important in the current environmental situation in the southern Aral Sea region.

Currently, the population of the South Aral Sea region uses drinking water from the following sources: tap water supplied through the Tuyemoyun – Nukus – Kungrad-Takhtakupyr water pipeline, as well as water withdrawn from the irrigation network, open water bodies, wells, desalination plants and water taken from underground wells. The hot, sharply continental climate of the South Aral Sea region leads to a deterioration in the living conditions of the population, forms the basis for a complex of diseases associated with the water factor, because in hot climates, water consumption increases by 8–10 times [10, 11].

In various areas of the South Aral Sea region of the Republic of Karakalpakstan (Muinak, Kungrad, Takhtakupyr, Kanlykul, Nukus, Khojeyli districts), a comprehensive assessment of various categories of drinking water (tap, well, open reservoirs) was carried out according to the main physicochemical components: water salinity (dry residue), hardness (Ca + Mg), the content of chlorides and sulfates, pH, the presence of organic matter (according to BOD5 and permanganate oxidation), nutrients, macro- and microelements. Mineralization of drinking water in the studied areas according to numerous literature data is sharply increased [2,3,4].

According to the requirements for the composition and properties of water, the content of suspended solids as a result of wastewater discharge should not increase by more than 0.25 and 0.75 mg/l. In accordance with hygienic requirements for the quality of drinking water, the turbidity should not exceed 1.5 mg/l. In the studied drinking water of the regions, the turbidity is 5–29 mg/l. Even a simple increase in salt in drinking water adversely affects the health status of the body [12]. In experimental animal studies, it was found that replacing water with a 25% salt solution (432.5 mg/100 g) can also inhibit development and alter metabolic processes in the offspring during pregnancy or lactation [12].

Under conditions of intense anthropogenic impact, the diversity of the composition of wastewater discharged into water bodies and streams makes it difficult to obtain complete and reliable information on the level of contamination by all harmful substances. Natural water quality, i.e. the degree of their suitability for practical use is determined by the composition and amount of dissolved and suspended substances, microorganisms and hydrobionts [4,5]. Accordingly, the assessment of the quality of natural waters can be carried out by chemical, physical, bacteriological and biological indicators.

The problem of chemical pollution of water is also the most difficult, since the removal of chemicals dissolved in water is economically and technically the most time-consuming and complex process [4,9]. It includes general requirements for water quality, consisting of several indicators of physical condition, chemical and bacteriological composition (temperature, suspended solids, mineralization, hydrogen index, dissolved oxygen, BOD, chlorides, sulfates, pathogens, etc.) and lists of maximum permissible concentration (MPC) for harmful chemicals. In water supply systems supplying water from surface sources, the percentage of cases of water quality deviations in some years reached 38% for chemical indicators and 43% for bacteriological ones. More than 90% of the population of the Republic of Karakalpakstan living in rural areas in the spring and summer use the water of the irrigation network, and in the winter time use water from wells and wells.

The current state is associated with the need to use groundwater. Changes in the hydrogeological environment often cause changes in the ecosystem and create special anthropogenic dynamics of the environment and public health [3,6]. The results of the analysis showed that the increases in the salinity of groundwater [2,4]. Mineralization in groundwater of the Republic of Karakalpakstan ranged from 0.8 to 14.9 g/l. Especially dangerous are the presence of Ca₂ + salts, and an excess of Mg. In underground drinking water there are residues of fertilizers: nitrates up to 4.25, ammonium ion up to 1.20, phosphate ion up to 0.7 mg/l. The proportion of

water samples in rural areas that do not meet sanitary and chemical standards for microbiological indicators, for water pipelines with underground sources is 7.0%, for water intakes from open water bodies - 4.6%, for sanitary-chemical indicators - 15,% and 27, 7%, respectively.

Sulfates are also found in the studied drinking water samples [2]. Their appearance is explained by the process of chemical excretion and dissolution of sulfur-containing minerals, mainly gypsum, as well as the oxidation of sulfides and sulfur. In samples of tap water, the content of ion sulfate (sulfates) is 577-900 mg/l, well 725-1550 mg/l, water in the channels 550-865 mg/l, that is, this indicator exceeds the MPC by 8-10 times. In addition to sulfates, sulfides are also present in aqueous samples. Their concentration in tap water is 0.001-0.019 mg/l, in well 0.001-0.017 mg/l, in channel water 0.001-0.018 mg/l.

It is well known that the presence of sulfides in drinking water is unacceptable. Their presence in drinking water is associated with processes occurring during bacterial decomposition and biochemical release of substances, and indicates bacterially contaminated drinking water used by the population [1, 6]. A comprehensive ecological approach to the analysis of patterns describing the relationship between environmental conditions and public health requires a quantitative assessment of not only changes in the human body, but also a quantitative assessment of information about the state of the environment. The study showed that a change in the chemical composition of drinking water directly affects public health and causes pathologies such as caries, fluorosis, anemia, digestive diseases, metabolic diseases, blood and blood-forming organs diseases, and urolithiasis.

The widespread introduction of sanitary-improving and anti-epidemic measures contributed to the prevention of epidemics associated with the use of low-quality water. However, infectious diseases transmitted through water are still not completely eradicated. Of great importance are substances that are found in drinking water in low concentrations, but play an important role in many physiological processes. According to the results of studies conducted by experts, the concentration of Co in the well water of the Muynaksky district exceeds the MPC by 2 times, Kungradsky by 1.6 times and Berunsky by 4 times [6, 7, 8]. The Fe content in all samples was lower than the MPC level. Iron deficiency in children can lead to increased absorption of Co in the digestive tract. The Mn content in Muinak and Kungrad regions was also lower than the MPC by almost 2-5 times. The excess of MPC was found in the well waters of the Takhtakupyr and Beruni districts. Insufficient intake of Marganum in the human body can lead to a violation of carbohydrate metabolism, dermatitis [2, 3, 5].

Based on our studies, we believe that high-quality drinking water supply should be given priority in the system of measures aimed at improving the living conditions and health status of the population of the South Aral Sea region. The quality of drinking water determines the strengthening of the direct and indirect influence of the "water factor" on the health status of the Aral Sea population.

IV. CONCLUSION

1. In recent years, certain indicators of nosological forms of diseases associated with the "water factor", such as infectious and parasitic diseases, diseases of the genitourinary system, as well as associated with other factors, such as blood and blood diseases - forming organs, diseases of the nervous system and organs feelings remain at a high level.
2. The water factor in the southern part of the Aral Sea region is one of the most dominant environmental factors affecting the health status of the population.
3. When developing stabilization activities, measures to mitigate the environmental situation, it is necessary to proceed from priority positions: rationalization of water use, improving the quality of surface waters, reducing the chemical load on the region, improving the living conditions of the population.

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