

EVALUATION OF THE ANTHROPIC IMPACT ON THE QUALITY OF DRINKING WATER IN THE REPUBLIC OF MOLDOVA

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ABSTRACT

In the increasing conditions of the anthropogenic factor of the hygienic state of water sources, there is a big problem of determining the role of water quality in shaping and changing the health status of the population. Public health is affected not only by environmental pollutants, but also by a number of biological, social, climatic, and geographical factors and conditions. There is also a problem with the chemical quality of drinking water, which, among the other environmental problems, is affecting the incidence of chronic non-communicable diseases.

Key words: Impact, drinking water, pollution, health, diseases.

Introduction

The anthropic impact on natural ecosystems is a combination of changes that occur as a result of human activity outside of environmental laws. Human beings and the environment interact with each other with a permanent exchange of matter, energy and information. Some natural cataclysms such as floods, earthquakes, volcanic eruptions have disrupted and will further affect human activity. However, humans also contribute to the deregulation of the ecosystem through harmful actions to the environment, and these cataclysms can sometimes be seen as an environmental response to this harmful activity.

The increase in human population and improvements in living standards, industrialization, and technology have led to the overthrow of the planet's support capacity, breaking the balance between people and the environment. The aquatic environment, of all ecosystems, is most affected by pollution, creating many problems for preserving and improving its quality. To a greater or lesser degree, it is difficult to avoid water pollution.

Deterioration of aquatic ecosystems through pollution is a detrimental change in the animal and plant world due to the invasion of pollutants into the environment [3]. Pollutants are waste products of human activity. The main effects of anthropic impact on natural ecosystems are the following pollution factors:

- chemicals: pesticides, gases, organic substances;

- physical: heat, radiation;
- biological: viruses, pathogenic bacteria.

Pollution is directly proportional to the quantitative growth of humanity, human needs and the development of new technologies. Since the permissible limits of pollution for human safety are not known, there is a tendency to underestimate its effects.

Physical pollution:

- Thermal or heat pollution: Various atmospheric gases lead to global warming through the greenhouse effect, the effects of global warming are catastrophic;

- Radioactive pollution: sources of radiation are sources of radioactive deposits, which got into the water with rain, and water used in factories;

Chemical pollution:

- Chemicals used in industry and agriculture are the most widespread and the most dangerous forms of pollution. Harmful agents released into the environment: pesticides, heavy metals, DDT are accumulated along trophic chains at increasing concentrations through the phenomenon of biological amplification. These substances are generally non-biodegradable or hardly biodegradable and therefore persist for a long time in the ecosystem. Examples of pollutants: a) Gases: carbon monoxide, sulfur dioxide, which in combination with precipitation water, produces acid rain; b) Nitrogen compounds contribute to the formation of smog; c) Halogen derivatives cause burns in plants and the disease called fluorosis in animals (bone deformation and tooth decay); d) Powders: quartz

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particles, calcium, asbestos, soot, lead particles, mercury, zinc, etc.

Biological pollution: Is produced directly by:

- the discharge of domestic and industrial wastewater into the watercourses or indirectly through their contamination with fermentable organic substances;

- water eutrophication: a natural process of accumulation over time of increased amounts of organic substances on the bottoms of natural water sources which contributes to the development of microorganisms that destroy the ecological equilibrium of the ecosystem [2].

Waters represent a basic natural source, that is of multilateral significance in human life. All physiological and biochemical processes take place in the aquatic environment. The quality of drinking water essentially influences human and animal health. Thus it is known that water has a very varied chemical composition, containing a large number of dissolved chemical elements. If the normal chemical composition of water is contaminated as chemicals are carelessly discharged into the ecosystem, the result can be an increase in the number of situations where such pollutants can affect human health.

The influence of minerals on health is complex. There are not only the direct effects of minerals on the human body, which physiologically are varied and multilateral. These pollutants can also interfere with the body's absorption and use of vitamins and enzymes, causing changes in hormones and other physiological problems. In the Republic of Moldova, one of the the main risks to health is the pollution of drinking water sources.

Nitrates are the most known toxic substances found in water. They should not exceed 50 mg / l. Consuming large amounts of water full of nitrates can cause the condition called the "nitrate intoxication" Water nitrates and human food are resorbed into the upper part of the intestine in a healthy body. In the case of dyspepsia and infections, favorable conditions are created for the transformation of nitrates into nitrites, which, in turn, block the transport of oxygen to the tissues. The existence of nitrates in drinking water is one of the biggest concerns in Moldova since about 65% of the fountains and 7% of the artesian wells used by the population contain water with concentrations above 50 mg / l of nitrates. The most affected districts are Telenești, Cahul, Florești, Ialoveni, Edineț, Rezina, Hâncești, Drochia, Fălești, Cantemir, Râșcani. The concentration of the nitrates in some water resources of these districts reaches very high parameters - 100-750 mg / l (2 to 15 times more than the maximum admissible limit).

Some mineral substances in water have been called "bio elements" or "mineral vitamins." Most of

these elements are obtained by ingesting food, however small amounts are absorbed from the atmosphere, this is normal and acceptable except the cases with air from heavily polluted regions. We also should note that water is a significant source for many mineral elements. Taking into account its dissolving capacity, water can extract different microelements from the soil, rock, construction materials, food and even from dishes and other utensils used in food preparation. It also can extract a various range of metals: cadmium, cobalt, copper, nickel, chromium, manganese, and others with toxic action, depending on its hardness or softness.

It is known that the hardness in water is caused by the presence of calcium and magnesium salt and also by hydrogen-carbonate ions found in soft waters. Local hygiene and epidemiology centers carried out the analysis of the groundwater in Călărași, Anenii-Noi, Hâncești, Criuleni and Ceadâr-Lunga districts regarding the degree of mineralization and hardness of the water in the wells. The results of the investigations revealed that the water from the fountains, compared to the artesian water, is characterized by a high degree of mineralization and a high hardness - up to 95.6% (Lăpușna village). The total hardness of the water is greatly increased in all mentioned localities. Thus, the number of samples that are higher than the standard of AMC (Agrometeorological Monitoring Center) varies from 76.6% to 100%.

If water does not contain enough salts as Ca^{2+} and Mg^{2+} , the mortality from cardiovascular diseases gets higher. An inverse correlation has been established between water hardness and cardiovascular mortality: the more reduced water hardness is, the lower the risk of those diseases." In heart function, Ca^{2+} has a particular role in decreasing its concentration (AMC = 30-100 mg / l), resulting in arrhythmias, disorders in blood clotting processes, and worsening of rickets. Also, Mg^{2+} plays an important role in cardiac automatism, in cases of Mg^{2+} deficiency (AMC = 10-40 mg / l) the risk of morbidity of newborns and hypertonic seizures is increased. Additionally, surveys indicate that about 50% of the rural population have no access to drinking water of a good quality. A big part of the rural population uses water with an increased content of fluorine (4-10 mg / l), hydrogen sulfide (5-20 mg / l), iron (1-2.5 mg / l), which affects their health condition.

Also, inorganic substances play a big role in maintaining the acid-base balance, in the active reaction of blood and tissues at a relatively constant level, as well as in hematopoiesis and immunity. Exceeding certain optimal quantities of elements, generates diseases as dangerous as those obtained due to their deficiency. For example, lack of

adequate iron concentrations (AMC = 0.3 mg / l) causes anemia, just as the excess of these concentrations in certain tissues or organs causes liver disease, diabetes and increases the risk of heart attack [5].

The excess of salt or water hardness higher than 15 mmol / l (AMC = 7 mmol / l) contributes to the occurrence of cholelithiasis, renolitics, osteoarthritis, as well as higher concentrations of fluorine over 5 mmol / l (AMC= 0,75-1.5 mmol / l) lead to osteofluorose. High fluoride content was found in some centralized water sources. The highest degree of pollution was established in the Glodeni, Fălești, Nisporeni, Ceadâr-Lunga and Taraclia districts, where the fluoride occurrence in water exceeds the standard of AMC by 50-100%.

The second group includes the Călărași district. Here the fluorine occurrence exceeds the AMC standard by 20-50%. In the third group exceeding concentrations are 10-20%. These are the districts of Anenii-Noi, Florești and Ungheni. The ratio of samples exceeding the AMC norms of fluorine in Moldova was on average 15% in 2007 compared to 12.9% in 2010. The number of people at risk of getting a disease caused by the absence or excess of fluoride is about 860 thousand, or in other words, it is 20% of the country's population.

In the case of large amounts of Ca²⁺ in the organism, the cellular permeability is reduced and hypotonia appears as a result, and in the case of an increased amount of Mg²⁺, the nervous system is negatively affected. The content of salt used by people for a long time, can also cause some premorbid conditions of the body. It can also associate with the genetic and biological particularities of the individual contributes to the triggering of water-related chemical pathologies.

The salt composition of water also affects blood biochemical indices. Thus, in the south of the Republic, where the water contains a large amount of dry residue, sulfates, hydrocarbons, chlorides, potassium and sodium, nitrates, a higher level of the following parameters in blood has been established, compared to the central area: calcium by 25% more; sodium - by 7%; albumin - by 9.2%, as well as decreased levels of phosphorus (by 9%) [1]. At the same time, some metabolic indices (minerals, carbohydrates, proteins) were observed in comparison with the biochemical indices of the population of the central part of the republic.

For the most part, many diseases can be avoided by distributing good quality drinking water to urban and rural populations. Sufficient amounts of quality water are not currently available to people nor to the natural or anthropic ecosystem needs. We

could say that although water is a regenerating resource, quality drinking water resources are insufficient to our planet and are becoming increasingly restrictive. Not all needed water can be provided due to numerous restrictions, and pollution is one of them. There are several types of water pollution, depending on the dissolved or disposed substances. We should also remember that water is the best solvent and dispersant in nature [4].

The evaluation of the relationships and links that exist between the anthropic component and the environment emphasizes the environmental potential of a territory and how it is used by society. The societal-environmental connections have experienced different types of manifestations, with different degrees of impact (negative and positive) on the environment, and the most damaging types appeared due to the activity of modern society. The elaboration of a study focused on the anthropic impact on water quality in the Republic of Moldova was a real challenge because of the complexity of the problem and the methodology used to investigate it. The study area represents a space with a great human impact with spatio-temporal dynamics marked by numerous changes and evolutionary bifurcations.

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