INTERNATIONAL MULTI DISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
eISSN 2394-6334 Impact factor: 7,854 Volume 12, issue 12 (2025)

WATER RESOURCE POLLUTION AND DRINKING WATER HYGIENE

Azizbek Khusanov Raximberdi ugli

Lecturer

G‘anijonov Asadbek Gavxarbek ugli

Student

Fergana Medical Institute of Public Health,

Uzbekistan, Fergana

Abstract: Water is the source of life and one of the most essential natural resources required for the survival, development, and reproduction of all living organisms on Earth. Approximately 60–70 percent of the human body consists of water, and daily physiological processes take place with its participation. At the same time, water is the main foundation of public utilities, agriculture, industry, energy, and communal services. However, in recent decades, the quality of water resources worldwide has been deteriorating. Population growth, intensified industrialization, weak environmental control, and climate change have placed serious pressure on water reserves.

This article comprehensively discusses the main causes and consequences of water pollution, ways to mitigate it, as well as the importance of drinking water hygiene and sanitary requirements.

Introduction. 1. Water Pollution: Basic Concepts and Types

Water pollution is defined as the deterioration of water quality resulting from the entry of harmful substances into water bodies, groundwater, or drinking water sources. The main types of pollution include:

1.1 Chemical Pollution

Chemical pollution occurs when chemical substances enter water, including:

- oil and petroleum products;
- heavy metals (mercury, lead, cadmium);
- pesticides and herbicides;
- household chemicals;
- industrial waste.

Chemical pollution is considered one of the most dangerous forms, as it not only affects water taste but also poses serious health risks.

1.2 Biological Pollution

This type includes contamination of water with microorganisms such as bacteria, viruses, and parasites. Common examples include:

- Escherichia coli (E. coli);
- Salmonella;
- dysentery pathogens;

- helminth eggs.
Biological pollution is often associated with sewage discharge or livestock waste entering water sources.

1.3 Physical Pollution

Physical pollution mainly involves:

- turbidity, sand, and solid particles;
- discharge of heated water (thermal pollution);
- plastic waste and microplastics.
As a result, water transparency decreases and aquatic ecosystems are disrupted.

2. Main Sources of Water Pollution

2.1 Domestic Waste and Sewage

In many developing countries, due to insufficient wastewater treatment facilities, domestic sewage is discharged directly into rivers, leading to the spread of intestinal diseases.

2.2 Industrial Enterprises

Oil refineries, metallurgical plants, chemical industries, and paint manufacturing facilities are among the largest contributors to water pollution.

2.3 Agricultural Activities

Fertilizers and pesticides infiltrate groundwater through soil, while waste from livestock complexes severely contaminates rivers.

2.4 Atmospheric Precipitation

Acid rain, dust, and smoke particles alter the chemical composition of water bodies.

3. Ecological and Health Consequences of Water Pollution

3.1 Ecological Consequences

- Death of fish and other aquatic organisms;
- Oxygen deficiency in water bodies;
- Excessive growth of algae (eutrophication);
- Disruption of ecosystem balance.
3.2 Health Consequences

Diseases associated with polluted water include:

- diarrhea and cholera-like infections;
- hepatitis A;
- skin diseases;
- poisoning due to accumulation of heavy metals;
- thyroid disorders;

- developmental disorders in children.
According to the World Health Organization (WHO), millions of people fall ill each year due to unsafe drinking water.

4. Drinking Water Hygiene

Drinking water hygiene is a set of public health requirements aimed at ensuring the safety of water for human consumption.

4.1 Main Hygienic Indicators of Drinking Water

- Microbiological purity – absence of pathogenic microorganisms;
- Chemical safety – nitrates, nitrites, and heavy metals within permissible limits;
- Organoleptic properties – acceptable taste, odor, and clarity;
- Radiological safety – radionuclides within regulatory standards.

4.2 Household Methods of Water Purification

- Boiling;
- Filtration;
- Special filter cartridges;
- Ultrafiltration devices;
- Chlorination or treatment with silver ions.

4.3 Hygiene in Drinking Water Storage

- Cleanliness of containers;
- Proper sealing and storage of water;
- Sanitary inspection of pipelines;
- Regular disinfection of containers.

5. Water Hygiene and Environmental Problems in Uzbekistan

Uzbekistan is one of the countries in Central Asia facing severe water scarcity. In addition, industrial and agricultural waste discharged into the Amu Darya and Syr Darya rivers, as well as the ecological disaster caused by the drying of the Aral Sea, negatively affect water quality. Although drinking water systems are being modernized in urban areas, the need for clean drinking water remains significant in some remote regions.

6. Measures to Protect Water Resources

6.1 At the State Level

- Transition of industrial enterprises to environmental standards;
- Introduction of waste-free technologies;
- Modernization of water treatment facilities;
- Strengthening environmental legislation.

6.2 At the Community and Population Level

- Water conservation;
- Compliance with drinking water quality requirements;

- Raising environmental awareness;
- Protection and cleanliness of local water bodies.

6.3 International Cooperation

- Cooperation with neighboring countries in water resource management;
- Participation in large international environmental projects;
- Implementation of WHO recommendations.

Conclusion

Water resource pollution is one of the most pressing environmental problems of the modern world, posing serious threats not only to nature but also to human health. Therefore, strict adherence to water hygiene requirements, water conservation, and the implementation of comprehensive measures at both state and societal levels are of great importance.

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