



DOI: 10.5281/zenodo.18475006

UDC: 613.31+614.777

EVOLUȚIA ȘI IMPORTANȚA SOCIO-IGIENICĂ A CONSUMULUI DE APĂ POTABILĂ

EVOLUTION AND SOCIO-HYGIENIC IMPORTANCE OF DRINKING WATER CONSUMPTION

Maria Curteanu^{1,2}

¹ "Nicolae Testemitanu" State University of Medicine and Pharmacy, Chisinau, Republic of Moldova

² National Agency for Public Health, Chisinau, Republic of Moldova

Rezumat

Introducere. Apa potabilă este esențială pentru viață și ecosisteme, iar creșterea populației și urbanizarea cresc cererea de apă, energie și alimente, agricultura fiind cel mai mare consumator de apă dulce. Utilizarea îngrășămintelor și pesticidelor amenință calitatea apelor subterane, care este esențială pentru Obiectivele de Dezvoltare Durabilă. În Europa, milioane de oameni nu au acces la apă potabilă sigură și la servicii sanitare adecvate, ceea ce duce la boli infecțioase și la expunerea la agenți neinfecțioși. În Republica Moldova, 65% din consumul total de apă provine din apele subterane, care prezintă probleme de neconformitate chimică și microbiologică, necesitând politici energetice și de utilizare a terenurilor mai eficiente.

Material și metode. Acest studiu este o sinteză narativă care analizează actele legislative și realizările științifice în domeniul apei și sănătății. Informațiile au fost extrase din baze de date precum PubMed, Google Scholar și Scopus, folosind cuvinte cheie în limba română și engleză. Documentele analizate includ lucrări științifice, acte normative și publicații despre sănătatea populației, cu accent pe legislația Republicii Moldova și reglementările internaționale. Analiza a identificat tendințe, lacune și recomandări pentru viitor, evaluând alinierea reglementărilor naționale cu cele internaționale și impactul asupra sănătății publice.

Rezultate. Legea nr. 182 din 19 decembrie 2019 a Republicii Moldova definește apa potabilă ca fiind apa destinată consumului uman, inclusiv apa utilizată în industria alimentară, cu excepția apei minerale naturale și medicinale. În mod similar, Legea nr. 458 din 8 iulie 2002 din România definește apa potabilă drept apa utilizată pentru consumul uman și în industria alimentară, cu excepții aprobate de autorități. Din punct de vedere istoric, tratarea apei a evoluat de la metode antice la tehnologii moderne de filtrare și purificare. Republica Moldova a adoptat multiple convenții internaționale privind protecția apelor, contribuind la îmbunătățirea legislației naționale. În prezent, accesul la apă potabilă și canalizare în Republica Moldova este inegal, afectând în special gospodăriile rurale și sărace. În România, resursele de apă sunt limitate și utilizarea lor trebuie gestionată cu atenție. Deși apa de la robinet este în general sigură, consumul de apă îmbuteliată este în creștere în Europa, influențat de percepțiile negative și de rapoartele media despre calitatea apei de la robinet. Un studiu al Națiunilor Unite sugerează că fondurile pentru apă îmbuteliată ar putea oferi acces universal la apă potabilă și pot reduce poluarea cu plastic.

Concluzii. În Republica Moldova persistă problema accesului la apă potabilă de calitate, necesitând informarea și educarea populației despre calitatea apei și sursele de poluare, precum și implementarea deciziilor și programelor guvernamentale în sectoarele de apă și sănătate.

Cuvinte-cheie: apă potabilă, apă îmbuteliată, stare de sănătate, măsuri preventive

Summary

Introduction. Drinking water is essential for life and ecosystems, and population growth and urbanization are increasing the demand for water, energy and food, with agriculture being the largest consumer of fresh water. The use of fertilisers and pesticides threatens the quality of groundwater, which is crucial to the Sustainable Development Goals. In Europe, millions of people do not have access to safe drinking water and adequate sanitation, which leads to infectious diseases and exposure to non-infectious agents. In the Republic of Moldova, 65% of total water consumption comes from groundwater, which presents problems of chemical and microbiological non-compliance, requiring more efficient energy and land use policies.

Material and methods. This study is a narrative synthesis that analyzes legislative acts and scientific achievements in the field of water and health. The information was extracted from databases such as PubMed, Google Scholar and Scopus, using keywords in Romanian and English. The analyzed documents include scientific papers, normative acts and publications about the health of the population, focusing on the legislation of the Republic of Moldova and international regulations. The analysis identified trends, gaps and recommendations for the future, assessing the alignment of national regulations with international ones and the impact on public health.

Results. Law no. 182 of 19 December 2019 of the Republic of Moldova defines drinking water as water intended for human consumption, including water used in the food industry, excluding natural and medicinal mineral water. Similarly, Law no. 458 of 8 July 2002 in Romania defines drinking water as water used for human consumption and in the food industry, with exceptions approved by the authorities. Historically, water treatment has evolved from ancient methods to modern filtration and purification technologies. The Republic of Moldova has adopted multiple international conventions on water protection, contributing to the improvement of national legislation. Currently, access to drinking water and sanitation in Moldova is uneven, affecting especially rural and poor households. In Romania, water resources are limited and their use must be managed carefully. Although tap water is generally safe, bottled water consumption is growing in Europe, influenced by negative perceptions and media reports about tap water quality. A United Nations study suggests that bottled water funds could provide universal access to drinking water and reduce plastic pollution.

Conclusions. In the Republic of Moldova, the problem of access to quality drinking water persists, requiring informing and educating the population about water quality and pollution sources, as well as the implementation of governmental decisions and programs in the water and health sectors.

Keywords: drinking water, bottled water, health status, preventive measures

Introduction

Drinking water is water that is intended for human consumption in its natural state or after purification, regardless of its origin and how it is delivered to the consumer through a water source or tank. According to the scientific researcher, Professor Gr. Friptuleac „water is the source of life and the main element of the biosphere, without which the existence of organic nature is impossible”. Wherever there is life, there is water in any form. Without water, important processes cannot take place. Body cells cannot exist without water” [1]. Almost all of the planet's freshwater is groundwater, which is particularly important for the proper functioning of ecosystems such as wetlands and rivers. Population growth, rapid urbanization and economic development are just a few of the factors driving the increase in demand for water, energy and food. Of these, agriculture is the largest consumer of freshwater resources in the world. In addition, the use of fertilisers and pesticides in agriculture poses a serious threat to the quality of groundwater [2]. Groundwater needs to be properly managed to achieve most of the Sustainable Development Goals (SDGs) of the 2030 Agenda. For example, the SDG 2.4 target on sustainable food production systems and resilient agricultural practices is based on available groundwater resources. At the same time, it is worth mentioning the SDG 6.6 target on the protection and restoration of water-related ecosystems, as well as the SDG 15.1 target on the conservation of freshwater ecosystems and their services [3]. In the European Region, more than 16 million people still do not have access to safe drinking water and more than 31 million people need basic health services. Meanwhile, 14 daily deaths due to diarrhea can be attributed to inadequate sanitation services. Infectious diseases caused by poor water quality, sanitation and hygiene include diarrhea, hepatitis A, legionnaire's disease, and soil-borne helminths. At the same time, water can also transmit to the population non-infectious agents such as arsenic, fluoride, lead and nitrates. The underground waters of the Republic of Moldova represent 65% of the total water consumption. The results of the monitoring of water quality in the centralised underground drinking water supply systems show levels of non-compliance with both chemical and microbiological parameters [2, 4, 5]. Avoiding the problem of groundwater depletion requires consistent policies on energy, land use and irrigation. At the same time, reducing food waste can also play an important role in reducing drinking water consumption globally and regionally [3].

Material and methods

Study design

This study is a narrative synthesis that examines national and international legislation, scientific and practical achievements in the field of water and health, as well as specialized publications. The analysis was carried out over a period of 24 years, between 2000 and 2024, to provide a comprehensive perspective on the evolution of knowledge and regulations in this field.

Database

The information used in this study was selected from open access databases such as PubMed, Google Scholar and Scopus, including relevant legislative and regulatory documents, using the Google search engine. Scientific studies containing information on the health status of the population of the Republic of Moldova in relation to the quality of drinking water have been included.

Search strategies and keywords

For the identification of relevant sources, the following keywords were used: “drinkable water”, “bottled water”, “mineral water”, “state health”, “preventive measures”. The searches were carried out in Romanian and English, covering a wide range of publications and documents.

Selection criteria

The following types of documents were selected for analysis: scientific papers, which present an analysis of the existing literature on water quality and health impact; normative and legislative acts, and, regulating the quality of drinking water and its relationship with public health, with emphasis on the legislation of the Republic of Moldova, but also on relevant international acts; publications about the health of the population, including, epidemiological studies and public health reports highlighting the incidence of water-related diseases of various types (potable, bottled, mineral).

Analysis and synthesis

The data collected has been analysed and summarised to identify trends, knowledge gaps and recommendations for future practices. Particular attention has been paid to comparing national and international regulations in order to assess their alignment and impact on public health.

Results and discussions

According to the definition of Law no. 182 of 19 December 2019 on drinking water quality in the Republic of Moldova “drinking water is water intended for human consumption, is: (a) water in its natural state or after treatment, used for drinking, food preparation, personal hygiene, home hygiene or household items, or, regardless of its origin and whether it is supplied through the distribution network, from the source or tank, or distributed in bottles or other containers; (b) water used in the food industry for the manufacture, processing, preservation or marketing of products or substances intended for human consumption; except natural mineral water, recognised by the competent authorities under the law; water with medicinal effects in accordance with the provisions of the law on medicinal mineral water approved by the Government; drinking water from water producers supplying on average less than 10 m³ per day or serving less than 50 people, unless water is produced in the course of a commercial or public activity. The values of the water quality parameters of these systems are all approved by the Government, with prior risk assessment, and do not pose a danger to the health of consumers. If it is established that, due to its quality, this water source poses a potential risk to human health, potentially affected populations will immediately receive

strict, appropriate recommendations” [6].

Law no. 458 of 8 July 2002 on the quality of drinking water in Romania, defines drinking water as ”(a) any type of water in a natural state or after treatment, used for drinking, drinking, when preparing food or for other domestic purposes, irrespective of its origin and whether it is supplied through the distribution network, from the tank or distributed in bottles or other containers; (b) all types of water used as a source in the food industry for the manufacture, processing, preservation or marketing of products or substances intended for human consumption, unless the Ministry of Health, the Ministry of Agriculture and Rural Development approves the use of water and it is demonstrated that the water used does not affect the quality and sanitation of the food in its finished form; (c) water from local sources, such as fountains, springs, etc., used for drinking, cooking or other household purposes; depending on specific local conditions, public health authorities may make an exception to the values of quality parameters, but without endangering the health of consumers” [7].

The first technical report on the water supply and drainage of important buildings in the city appeared in 98 AD, written by Sextus Iulius Frontinus, a member of the water commission in Rome. The earliest mentions of water treatment are found in Sanskrit medical teachings (2000 AD) and on Egyptian inscriptions on the walls (seventh and XIIIth centuries AD). These inscriptions mention how to purify dirty water by boiling in a copper boiler and cooling in a clay pot, sun drying or filtration through a brazier. In the Middle Ages, the only known method of purification was the use of sand filters and the preservation of water in silver containers. The beginning of the twentieth century brought significant changes in the design of wastewater treatment plants, equipped with fast sand filters, drinking water distribution networks, etc, centralized sewers and construction of new wastewater treatment plants. Henry Darcy patented the first filter necessary for the purification of water intended for the supply of cities in 1856, and formulated the hydraulic laws necessary for their calculations. The first wastewater treatment plant to use the active sludge process was built in Manchester in 1916 [8].

From the legislative point of view of the protection and prevention of all drinking water sources, the Republic of Moldova has benefited from a significant evolution since the proclamation of independence. On January 4, 1994, the Helsinki Convention on the protection and use of transboundary water courses and international lakes (1992) was ratified by the Parliament of the Republic of Moldova [9]. In 1999 and 2005, the UN Economic Commission for Europe and the World Health Organization Regional Office for Europe strengthened bilateral and multilateral cooperation for the prevention, prevention and, control and reduction of water-related diseases by adoption in London on 17 June 1999 and entry into force on 4 August 2005 of the Protocol on Water and Health at the 1992 Convention on the protection and use of cross-border watercourses and international lakes [10]. In 1994, the Espoo Convention on the environmental impact assessment in the transboundary

context (1991) was partially transposed into national law by Law no. 851 of 1996 on ecological expertise and environmental impact analysis and applied in impact assessment on the construction of several objects, including the Giurgiulesti terminal on the Prut and Danube rivers [11]. In 1999, the ICPRD Convention on the protection and conservation of the Danube River (1994) created the general legal instrument for cooperation in the field of cross-border water courses management in the Danube river basin. The ICPRD Convention was ratified by the Republic of Moldova on 29 August 1999, which is part of the management committee of the Danube river basin [12]. On March 10, 2000, the Republic of Moldova signed, and by Law no. 207-XVI of 29 June 2005 ratified the Protocol on Water and Health at the 1992 Convention on the protection and use of transboundary watercourses and international lakes, the instrument of ratification of the said Protocol shall be sent to the depositary. The Republic of Moldova became part of the Protocol on 15 December 2005 [10].

In recent years, drinking water issues have become as important to national security as public health. The national program for the implementation of the Protocol on water and health in the Republic of Moldova for the years 2016-2025 (Government Decision no. 1063 of 16 September 2016) and the Law of the Parliament of the Republic of Moldova no. 182 of 19 December 2019 on the quality of drinking water aims to improve the quality of life of citizens and ensure access to drinking water and improve sanitation by planning the necessary measures to achieve the target objectives of the Water Protocol and Health. The law on drinking water quality aims to establish the legal framework for drinking water quality, and the measures which the responsible authorities must take to ensure compliance with the quality of drinking water [13]. According to ”Report of Progress (since 18.02.2022) on transposition of the National Program for the implementation of the Protocol on water and health in the Republic of Moldova for the years 2016-2025 (Government Decision no. 1063 of 16 September 2016)” access to water and sanitation in the Republic of Moldova is mainly defined by residence and income. Rural and poorer households on average have twice the water and sanitation access compared to urban households [14]. According to the Press Office of the National Administration ”Romanian waters”, Romania’s water resources are relatively poor and unevenly distributed in time and space. These theoretically amount to 134.6 billion mc (consisting of surface waters - rivers, lakes, the Danube River - and groundwater), of which the usable resource, is, according to the degree of arrangement of river basins is about 40 billion mc. Romania’s specific endogenous resources reported to the population are 1,894 m³/year/place, Romania being one of the countries with the lowest water resources in Europe. As a result, it is particularly important that water is used judiciously by the population, but also by the other sectors of the national economy as people use a lot of water for drinking, drinking, cooking, washing, but also more water for food production and more. In households, water is used about 33% for

toilets, sinks and bathrooms 48%, cleaning 10%, cooking and drinking 1% [15].

Although in most European countries there is quality drinking water being filtered, the bottled water industry has the fastest growth rate, with particularly adverse consequences on the environment [16]. Europeans are currently buying more bottled water than ever before, despite strict controls that ensure the potability of the vast majority of tap water [17]. The main reason that prompted consumers to switch from tap water to bottled water is the increasingly bad quality of water, perception fueled by TV reports that have created a negative image on tap water consumption – communication about poor water quality and health risks and own consumer experience by creating physical discomfort [18].

A United Nations study shows that half of the money spent worldwide on the purchase of bottled water, whose sales have exploded in recent decades, sufficient to

ensure universal access to drinking water. Stopping the consumption of bottled water would also reduce plastic pollution. The perception of the population is that bottled water is a healthier option. Pollutants have been found in hundreds of brands of bottled water in more than 40 countries, often exceeding local or global standards. It also warns of the lack of regulation surrounding the bottled water industry and stresses the inability of governments to keep up with the galloping expansion of this sector [19].

Conclusions

1. In the Republic of Moldova, there remains a problem of ensuring the population with quality drinking water.

2. It is necessary to inform the population, education campaigns and awareness about the quality of drinking water and the sources of water pollution.

3. It is necessary to implement governmental decisions and programs in the water and health sectors.

Bibliography

1. Friptuleac Gr. Igiena mediului [Environmental hygiene]. Chișinău: CEP Medicina, 2012.
2. Apele subterane – să facem invizibilul vizibil. Available from: <https://ansp.md/apelle-subterane-sa-facem-invizibilul-vizibil>. Accessed at 28.06.2024.
3. Obiectivelor de Dezvoltare Durabilă (ODD) ale Agendei 2030 [Sustainable Development Goals (SDGs) of the 2030 Agenda]. Available from: <https://statistica.gov.md/ro/obiectivele-de-dezvoltare-durabila-183.html>. Accessed at 28.06.2024.
4. Dumitras C, Rotaru C, David C. Quality of groundwater used for human consumption. *One Health & Risk Management*. 2022;3(25):30. Available from: <https://journal.ohrm.bba.md/index.php/journal-ohrm-bba-md/article/view/333>. Accessed at 28.06.2024.
5. Ciobanu E. Hygienic assessment of drinking water pollution with organic substances. *One Health & Risk Management*. 2022;3(25):18. Available from: <https://journal.ohrm.bba.md/index.php/journal-ohrm-bba-md/article/view/320>. Accessed at 28.06.2024.
6. Legea nr. 182 din 19-12-2019 privind calitatea apei potabile [Law no. 182 of 19-12-2019 regarding the quality of drinking water]. Available from: https://www.legis.md/cautare/getResults?doc_id=119769&lang=ro. Accessed at 27.06.2024.
7. Legea nr. 458 din 8 iulie 2002 privind calitatea apei potabile [Law no. 458 of July 8, 2002 regarding the quality of drinking water]. Available from: <https://legislatie.just.ro>. Accessed at 23.06.2024.
8. Programul Național pentru implementarea Protocolului privind Apa și Sănătatea în Republica Moldova pentru anii 2016-2025 [The National Program for the implementation of the Protocol on Water and Health in the Republic of Moldova for the years 2016-2025]. Available from: https://unece.org/DAM/env/documents/2016/wat/Moldova_National_Forum_Water_for_Health/Prezentare_Protocol_Apa_Sanatate_vuln.gr.pdf. Accessed at 23.06.2024.
9. Convenția de la Helsinki privind protecția și utilizarea cursurilor de apă transfrontieră și lacurilor internaționale (1992) [The Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes]. Available from: <https://www.environment.md>. Accessed at 25.06.2024.
10. Legea nr. 207 din 29-07-2005 pentru ratificarea Protocolului privind Apa și Sănătatea la Convenția din 1992 privind protecția și utilizarea cursurilor de apă transfrontiere și a lacurilor internaționale, semnată la 10 martie 2000 [Law no. 207 of 07-29-2005 for the ratification of the Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes, signed on March 10, 2000]. Available from: <https://www.legis.md>. Accessed at 25.06.2024.
11. Legea nr. 851 din 29-05-1996 privind expertiza ecologică [Law no. 851 of 05-29-1996 regarding ecological expertise]. Available from: <https://www.legis.md>. Accessed at 25.06.2024.
12. Convenția din 29 iunie 1994 privind cooperarea pentru protecția și utilizarea durabilă a fluviului Dunarea (Convenția pentru protecția fluviului Dunarea), semnată la Sofia la 29 iunie 1994 [Convention of June 29, 1994 regarding cooperation for the protection and sustainable use of the Danube River (Convention for the Protection of the Danube River), signed in Sofia on June 29, 1994]. Available from: <https://legislatie.just.ro>. Accessed at 25.06.2024.
13. Progress on Drinking Water and Sanitation: Special Focus on Sanitation. 2008. Available from: <https://unece.org>. Accessed at 25.06.2024.
14. Raportul de progres (din 18.02.2022) privind implementarea Programul național de implementare a Protocolului privind apa și sănătatea în Republica Moldova pentru anii 2016-2025 (Hotărârea Guvernului nr. 1063 din 16 septembrie 2016) [The progress report (from 18.02.2022) regarding the implementation of the National Program for the implementation of the Protocol on water and health in the Republic of Moldova for the years 2016-2025 (Government Decision No. 1063 of 16 September 2016)]. Available from: <https://mediu.gov.md>. Accessed at 28.06.2024.
15. Raport sintetic triannual 2008, 2009, 2010 [Triennial synthetic report 2008, 2009, 2010]. Available from: <https://insp.gov.ro>. Accessed at 28.06.2024.
16. Componentul ecologic activ și bioeconomia: opinii asupra consumului de apă îmbuteliată pentru uz [The active ecological component and the bioeconomy: views on the consumption of bottled water for use]. Available from: <https://drive.google.com>. Accessed at 28.06.2024.
17. Extinderea și modernizarea infrastructurii de apă și apă uzată pentru regiunea Constanța – Ilfov [Expansion and modernization of the water and wastewater infrastructure for the Constanța - Ilfov region]. Available from: <https://rajac.ro>. Accessed at 28.06.2024.

18. Cum se raportează românii la consumul de apă îmbuteliată? Studiu Calitativ [How do Romanians relate to the consumption of bottled water? Qualitative Study]. Available from: <https://www.exactbusiness.com>. Accessed at 28.06.2024.
 19. Studiu ONU: oprirea consumului de apă îmbuteliată ar avea consecințe benefice pentru oameni și mediu [UN study: stopping the consumption of bottled water would have beneficial consequences for people and the environment]. Available from: <https://www.medichub.ro>. Accessed at 22.06.2024.
-

Received – 18.07.2024, accepted for publication – 14.08.2024

Corresponding author: Maria Curteanu, e-mail: uglea.maria@gmail.com

Conflict of interest Statement: The authors reports no conflicts of interest in this work.

Citation: Curteanu M. Evoluția și importanța socio-igienică a consumului de apă potabilă [Evolution and socio-hygienic importance of drinking water consumption]. *Arta Medica*. 2026;98(1):52-56.