

Drinking Water Quality and Human Health: A Review

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Abstract - Public health is highly dependent on the quality of drinking water. Access to safe drinking water remains a challenge despite recent advances in the field. The World Health Organization estimates that 10% of the global population does not have access to improved water quality, and one of the United Nations' Sustainable Development Goals is to ensure that everyone can use a toilet 2030. Up to a million individuals every year lose their lives because of waterborne bacteria that cause diarrhea. They're mostly less than five years old. Even though it has been there for a while in the wealthy world, chemical pollution is only growing in frequency in low- and middle-income countries. Numerous chronic diseases, such as cardiovascular disease and cancer, and adverse reproductive outcomes have been linked to chemical exposure in drinking water and negative impacts on children's health, such as neurodevelopment.

Keywords - Drinking water, Water quality, WHO, Diseases.

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INTRODUCTION

In addition to being essential to the development of the economy and the preservation of the environment, water is one of the most vital natural resources for the flourishing of all life on Earth. And it's a living part of the soil and plants, too. Liquid water is thought to be possible only on Earth, although no other planet in the cosmos has been found to support such a condition. Approximately 96.5 percent of the world's water is located in the seas, 1.7 percent is found in the ground, and 1.7 percent is frozen in the polar ice caps and glaciers. Fresh water makes up just 2.5% of Earth's total water supply, and of that only 0.3% is found in surface water while the other 98.8% is frozen or underground. Even less of the water on Earth is in liquid form; just 0.001% is not in the form of vapour, cloud, or other airborne material that eventually precipitates. Whether in the form of surface water or groundwater, water is essential to human survival and the maintenance of a wide variety of human endeavors.[1]

The chemical composition of surface water is discovered to be very varied as a result of differences in the proportional contributions of ground water and surface water. Some of the current significant causes responsible for water quality deterioration include the discharge of harmful chemicals, the excessive abstraction of water from aquifers, and the poisoning of water

bodies with substances that encourage algae growth. As a result, much of the water is said to need treatment before it can be consumed by humans. Since surface water is scarce and often rejected, Haryana's population must rely heavily on underground aquifers. Ground water forms when precipitation seeps into the soil and worn rock strata below and then travels through these layers into the subsurface.[2]

Drinking water, as well as water for industry and agriculture, may be drawn from the ground if surface water is sparse. According to estimates, India withdraws more than 230 km³ of ground water per year, making it the country with the greatest rate of ground water consumption in the world.[3]

Haryana is a state in India with a population of over 100 million, and more than 98% of its residents rely on ground water for their daily consumption of water. The importance of ground water quality in addition to quantity is now well acknowledged. There are both natural and anthropogenic factors that contribute to groundwater contamination. Once ground water has been tainted, stopping pollution at its source will not improve its quality. Many rural regions do not have access to safe drinking water because of a lack of water treatment facilities. Since drinking water quality is crucial to public health. There must be systematic collection, monitoring,

and analysis of comprehensive data on drinking water quality.[4]

We depend on water to survive. The beauty of our watery planet as seen from space beyond words. Water is exceptional in the Universe due to its one-of-a-kind chemical composition. The presence of liquid water on Earth is what allowed for the development of life on our planet and nowhere else in the solar system. Since the beginning of time, water's chemistry has provided a favorable environment for the growth of life on Earth. There wouldn't be any life on Earth without it. Water is the only naturally occurring material that can exist in all three main states of matter. Since it can dissolve almost everything, water plays an essential part in almost every human endeavor. Ag, ind, en, and life all rely on water to thrive. [5]

Our survival depends on water, making it the most important chemical element. To put it simply, life on Earth depends on water. Water's presence molds, refreshes, and sustains our globe. Water's transformational enchantment lies in the fact that it may take on many forms and move from one location to another. To put it simply, water is the oxygen that sustains life on Earth. Constantly supplying it with nutrients, oxygen, and other necessities of life. There is never any stillness in water. It constantly changes locations throughout the globe. The planet seems blue to us. To say that water has had a defining role in human history is an oversimplification.[6]

Given its centrality, it's only fitting that we mark its appearance on certain occasions with appropriate observances:

MARCH 22ND - WORLD WATER DAY JUNE 8TH – WORLD OCEAN DAY

1980s – INTERNATIONAL DECADE OF WATER

Seventy-five percent of Earth is covered by water, and every living thing depends on it. Nearly all of Earth's water is locked up in the planet's salty oceans, making it unfit for human consumption or agricultural use; the remaining 1.7% is distributed among groundwater, glaciers, and the ice caps of Antarctica and Greenland; the remaining 0.001% is found in vapor clouds; and the remaining 0.01% is found in other large water bodies. All life on Earth depends on the 2.5% of the planet's water that is freshwater, and of that, 98.8% is locked up in ice and underground aquifers. [7-8]

The amount of freshwater found in rivers, lakes, and the air is less than 3% of the total. The quantity of freshwater included in living things

and man-made objects is much lower, at only 0.003% of the total. There is more than 30 percent of the world's fresh water just where we stand. Water makes up 366 quadrillion gallons of Earth's total mass. Unfortunately, just 0.0007% of it is drinkable. Seven billion people now have to split this finite supply. Daily water intake should be between two and five liters. Blood is mostly water (around 55%). The average human body is between 55% and 78% water. In 2005, researchers led by Jeffrey Utz found. Potable water, often known as drinking water, is water that is safe for human consumption.[9]

Water found in subterranean aquifers, springs, and other underground sources is known as groundwater. By natural means, it rises to the surface. Springs and seeps are common places for this to happen. The percentage of the world's water that comes from groundwater is relatively small, but significant: roughly 20% of the fresh water supply. The water that is stored underground may be used later on in the water cycle. The overexploitation of groundwater, however, may lead to serious consequences for both humans and the natural world. The water table is dropping, making it impossible for current wells to provide water. The massive pumping of wells has caused the water table to fall hundreds of feet in several areas.[10]

When it comes to ground water use, India dominates the global stage. The number of groundwater wells has increased from fewer than one lakh in 1960 to approximately 12 million in 2006. Since 1979, groundwater levels in Punjab have decreased by 10 meters, and the pace of depletion is increasing. This view is shared by others. Problems like subsidence due to groundwater depletion and saltwater intrusion may be exacerbated by a reduced table. "Groundwater recharge" is developing as a potential solution to overuse of groundwater in India. Gathering rainfall that would otherwise run off and putting it to use recharging aquifers is what this method entails. Pollutants dumped on the ground may eventually seep into aquifers, contaminating the water supply. Calcium and magnesium ions, as well as trace amounts of iron and manganese, may be found in all groundwater. [11-12]

The term "surface water" refers to the water found in a natural setting such as a lake, river, stream, or wetland. Many businesses and towns have turned to using treated surface water as an alternative to drinking water because of its lower cost and greater reliability. In most cases, the foul odor and taste come from the high concentrations of suspended particles, bacteria, algae, organic waste, and other such contaminants that it contains.[13]

Safe drinking water is the water that comes out of the faucet in your home or at the local water fountain (valve). In the industrialized world, access to piped water in cities began in the final quarter of the 19th century and was widespread by the middle of the 20th. Water-borne illness incidence is drastically reduced when people have ready access to piped-in water. During the water treatment process, chemicals like chlorine are added to the water supply to destroy harmful microorganisms and modify the water's pH.[14]

There are a variety of places that may provide usable water:

1. Public water systems
2. Sources of water such as wells
3. Transported by truck
4. Water that has been purified from sources such as rivers, streams, lakes, rain, etc.

It is crucial that potable water be protected from being tainted by sewage (disposal). Contamination of water sources has been the leading cause of death for mankind throughout history. About 2 million people every year, predominantly children under the age of 5, die as a result of waterborne illnesses like diarrhea that are caused by a lack of clean water, inadequate sanitation, and lackadaisical hygiene practices UNICEF. Inadequate access to clean water is the leading cause of death in the globe, according to the United Nations. In the developing world, 27% of city people do not have access to running water in their homes. Nearly 40 percent of the world's population does not have access to a toilet. One in three persons in nations with low incomes per capita do not have access to clean water.[15]

Since more people need water, many of the world's aquifers are running dry. Politicians, scholars, and journalists have all speculated, with increasing frequency over the previous quarter century, that conflicts might break out over water rights. The next battle in the Middle East will be fought for water, not politics, according to former Egyptian Foreign Minister and UN Secretary-General Boutros Ghali. The United Nations Secretary-General at the time, Kofi Annan, predicted that "Fierce rivalry for freshwater may become a cause of strife and conflicts in the future" in 2001. Ismail Serageldin, a former vice president of the World Bank, predicted that "the conflicts of the next century would be over water unless fundamental reforms in governance occur." [16]

Likewise, groundwater reserves are vulnerable to contamination by pollutants that seep underground. City sewage and commercial wastes are the main polluting sources of water. Another significant source of water pollution is

agricultural run-off from fields, which often includes toxic pesticides and fertilizers. Only around 10% of the wastewater produced today is treated. We just release the remaining waste into local water supplies. Because of this, contaminants are found in rivers, lakes, and the earth. Extremely high levels of caries-causing bacteria and other contaminants are common in such water. Similarly, there are many different types of dissolved or suspended pollutants in domestic sewage.[17]

Water pollution makes it unsafe for human consumption, as well as other uses in food production, manufacturing, and leisure. Many of the chemicals present within are acutely carcinogenic, posing a threat to human health. Over a thousand individuals in Japan became ill with a rare ailment called Minimata disease between 1953 and 1958; the condition was brought on by mercury thrown into a bay by a plastics manufacturer. Water contamination is a global problem that affects everyone. That's why more and more people throughout the globe are starting to worry about it.[18]

For the purposes of the modified broadley classification of water diseases (1977) Waterborne diseases may include:

Diseases known as "water-borne" are those acquired after drinking water tainted with human or animal waste. To name a few of the many illnesses that:-

VIRAL : Hepatitis A and E, Poliomyelitis, Rota virus Diarrhea.

BACTERIAL : Typhoid and Paratyphoid Fevers and Bacillary Dysentery, E. coli, Diarrhea, Cholera

PROTOZOAL : Amoebiasis, Giardiasis.

HELMINTHIC : Ascariasis, Enterobiasis.

Diseases spread by poor hygiene practices or through direct skin or eye contact with polluted water are known as "water-washed diseases." Various illnesses transmitted by fleas, lice, and ticks, such as scabies, trachoma, and typhus.

Diseases spread by contact with water are called water-based diseases. These diseases are caused by parasites that infect water-based intermediary organisms. Instance: schistosomiasis. Insect vector-borne diseases, such as those spread by mosquitoes, often thrive in stagnant or otherwise polluted bodies of water. Diseases like Dengue, Filariasis, Malaria,

Trypanosomiasis, and Yellow Fever are examples.

Problem of water contaminated Diseases:

1. Nearly 80% are infectious diseases
2. More than 5 million people die each year
3. More than 2 million die from water related diarrheal alone
4. Most of these dying are small children

Water is put through a battery of tests to see whether it meets the standards necessary for human consumption and household use. Key indicators of safe drinking water include:

1. **Microbiological:** Coliform bacteria, *Escherichia coli*, *Vibrio cholerae*, and other viruses & protozoan parasites are all examples. Contamination from sewage is indicated by the presence of fecal coliforms (such as *E. coli*). Protozoan oocysts including *Cryptosporidium*, *Giardia lamblia*, *Legionella*, and viruses are all potential pollutants.
2. **Physical and Chemical:** Total suspended solids (TSS), turbidity, pH, metals, dissolved organic compounds, and trace elements are all measured. Both the aesthetics and flavor of drinking water are affected by physical characteristics, which may also make it more difficult to filter out harmful microorganisms. Health risks from chemical factors are often more long-term in nature.

Microbiological water testing relies on the presence of coliform bacteria. Coliforms are members of the family Enterobacteriaceae. Members of the coliform group are defined as follows in standard procedures for the analysis of water and waste water:-

1. Bacteria that can digest lactose into gas and acid within 48 hours at 350 degrees Celsius, including both aerobic and facultative anaerobic strains that are gram negative and do not produce spores
2. Gram-negative, rod-shaped bacteria that, after 24 hours at 350 degrees Celsius on Endo Type Medium with lactose, produce a crimson colony with a metallic shine.

WATER QUALITY INDEX (WQI)

The water quality index (WQI) is a useful tool for figuring out whether or not water is fit for human consumption. In order to determine whether or not surface and ground water are drinkable, a water quality index was developed.[19]

Intended consumption. Water with a Water Quality Index (WQI) of 25 or below is regarded to be of exceptional quality for human consumption, while water with a WQI of 25 to 50 is considered to be of high quality. When the Water Quality Index (WQI) is between 50 and 75, the water is regarded to be of a moderate level of pollution; between 75 and 100, the water is considered to be of a severe level of pollution; and over 100, the water is considered to be unsuitable for drinking purposes.[20]

CONCLUSION

The co-editors were pleased to have collected 20 articles from international teams on such vital themes despite a number of limitations. Our limited experience shows the wide range of potential health consequences associated with microbial and chemical pollution of drinking water. In rural locations, where water treatment is often insufficient, the quality of the source water is one of the most important elements influencing the safety of the drinking water available there. Therefore, it is helpful to have an understanding of the variables that affect the quality of the water at its source.

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