IOSR Journal of Biotechnology and Biochemistry (IOSR-JBB)
ISSN: 2455-264X, Volume 9, Issue 5 Series I (Sept. – October. 2023), PP 24-29
www.iosrjournals.org

Water- The Avant-Garde

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Graphical Abstract

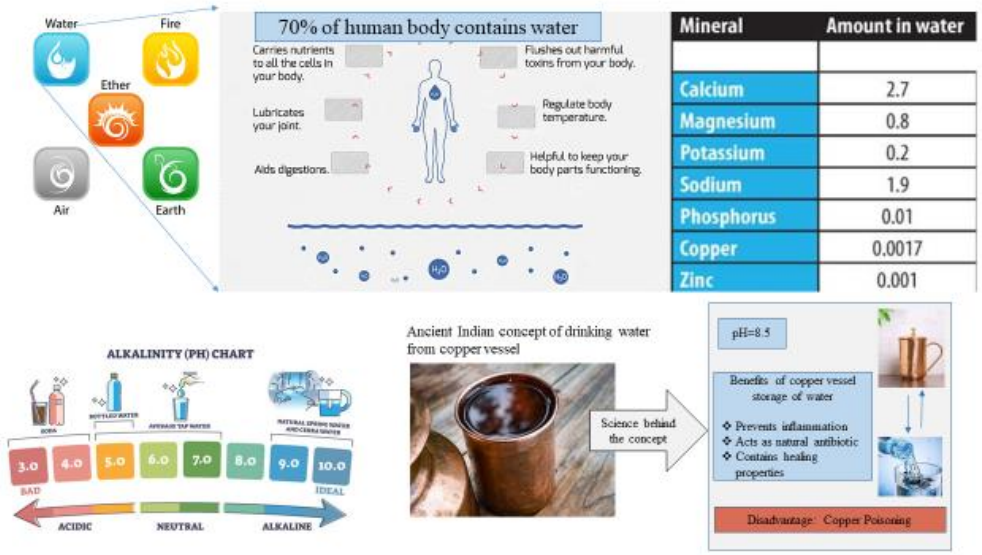

Figure 1: Conceptualization of water: a model traced from history to modern science

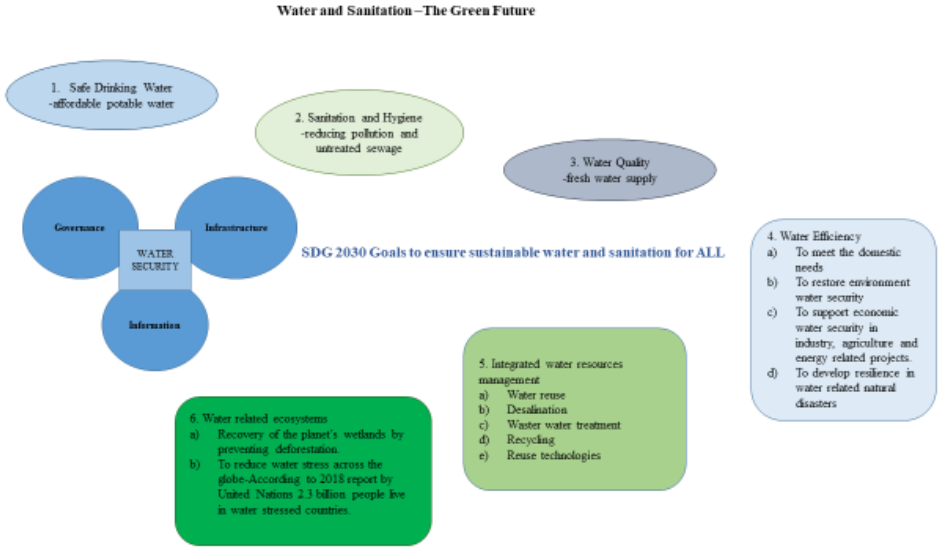

Figure 2: Interlinked Water security and Sanitation goals of global importance

Date of Submission: 09-10-2023 Date of Acceptance: 19-10-2023

I. What History Tells About Water as the Optimal Life Line of Living Beings

According to religion and science, when Spirit manifests itself into life in the form of a gross-body, it is called *Nature*, where Spirits immutable, a primordial energy-neither created nor destroyed, whereas *Body* is mutable, goes through change of state - cyclic in nature. *The gross body* is made up of five elements from subtle to gross body, and they are: Ether, Air, Fire, Water and Earth, respectively. All life forms, is a microcosm of nature, and hence, it contains all five elements that are intrinsically linked to human through senses including five actions expressing functions of each of the sensory organs. Ether, Air, Fire, Water and Earth are linked to Hearing, Touch, Vision, Taste and Smell, respectively (1).

The Water, among the five elements are equally essential for all forms of life on Earth, is the second most important, after Air - being the first among five elements of equal importance, for sustenance of life - the gross-body. It is an established fact that over 70% of human body contains water - by extension, it can be said that almost all other forms of life on Earth contain similar quantity of water as human beings, but in varying degrees. It is interesting to note that 70% of Earth's surface is also covered by water. The remaining elements (Ether, Air, Fire and Earth) are also present in all other forms of life including the Earth itself. Hence, the human life and health are intricately linked to the water component of the Planet Earth (2).

Water is of utmost significance - the reasons are very simple because it constitutes more than 70% of our body; we need water more than anything else in our everyday life including drinking, and above all, we see all over the world there is a scarcity of fresh-water supply. The trend is growing and getting worse, and it will become more acute as the years go by, and it may even become an issue of conflict between nations, and may lead to war. However, discussion is aimed at its impact, to a large extent, on human health along with health of other forms of life on this planet (3).

In all traditions and cultures, water had been and is revered and respected for one reason or other, and particularly in Indian context, Water-God, is worshiped. In fact, there is a saying in India that when translated into English, goes like this "Another name of Water is Life". Since over 70% of human body contains water, and if the water in our body can be kept and maintained electro-chemically balanced and pure with requisite amount of minerals then 70% of our health (gross-body) concerns will be taken care of. The next element is Air –the cosmic energy – the life energy without which gross-body dies within a few seconds when compared to water without which human and all other forms of life can survive much longer than few seconds. Air constitutes approximately 6% of our body. If we can put our hearts and minds on these two elements along with element Earth (minerals) then 86-88% of elements in our body will be in perfect balance and harmony. As a result, it can be concluded that we will have very little internally generated health issues. It's a well-established fact that most of our health problems are of our own making - internally generated ones, and a very few comes from external sources (4).

Our ancestors from time immemorial stored water in a copper vessel to kill bacteria and micro-organisms naturally present in water drawn from a Well. The water that is drawn from a Well also contained minerals depending on the region and its composition of earth's crust. Hence, water obtained from the Well used to contain some major and few trace minerals that are essential for human body, as a matter of fact for all forms of lives. That's why water in different regions of the Earth tastes different. Many countries did not have water purifiers or filters and did not know this fact as we do now. They boiled the water, or had to find ways to kill bacteria in the water before drinking. Use of copper vessels was one of the ways, and later on brass, a compound of Copper and Zinc, vessels were added. The Oligo dynamic effect of copper not only killed bacteria in the water but also ionized it, and the undesirable minerals (like, S, Cl, I etc.) coming in contact with copper in the presence of water formed a compound, thus neutralizing the effects of the undesirable minerals through electro-chemical process – thus making water suitable for human consumption. This is evident when one looks at the inside surface of a cooper vessel after prolong use of storing water in it - a coating/layer of dark metallic oxides. This needs cleaning every 2-weeks using natural means – in olden days, charcoal-ash or tamarind with coconut fibres, as brush, were used to clean copper and brass wares. Today's water purifying system tends to strip water of minerals and introduce chemicals that have long term harmful effects on human health, in the name of purifying the water. There are five (5) major essential minerals in water, and they are Calcium, Phosphorus, Potassium, Magnesium and Sodium; and sixteen (16) essential trace minerals, and they are Iron, Cobalt, Copper, Sulphur, Zinc, Molybdenum, Manganese, Iodine, Selenium, Chlorine, Boron, Silica, Vanadium, Nickel, Arsenic and Chromium depending on the characteristics of earth's crust. Functions of some of these minerals, like Copper, Manganese, Zinc, etc., on human health are known to the mankind, whereas for the rest, it's not yet known (5,6).

Apart from use of Water in other areas of everyday life, the focus is on daily consumption of water that has its impact on health that eventually percolates to healthy body and mind. The intent is not only to drive the point of its benefit that we all know, but also to internalize, propagate and follow in everyday life through transfer of knowledge and practice. To begin a day, first thing in the morning, after getting up from bed, is to drink a liter of water kept in room temperature and aged 15-18 hours in a copper vessel, and the daily intake of such water should be 2-liters for adults at a regular interval, but always at least and preferably, an hour before a meal, and

then 45 min. after the meal drinking a glass of Luke-warm normal water, but it is advisable not to drink water during meal – it dilutes the digestive saliva/enzyme resulting in poor digestion (7).

From traditional knowledge and current evidences supported by recent studies and research, storing water in a copper-vessel over a period of 15-18 hours makes it free from bacteria and other micro-organisms found naturally in water. That's why from ancient times in India copper and later on brass-wares were used extensively in daily lives. As a matter of fact, in ancient India, *religious wonderers called sanyasis,* used to carry, among other personal belongings, a copper/brass water-pot – known as *Komondulu, for storing drinking water*, and it is assumed it was for the same reason – to make the water bacteria free. In remote villages where the way of life was like a couple of centuries old, and where brass, copper and Cast Iron wares including earthen wares were used. Also, used clay pots as water- pitchers, distillation of water using old traditional filtration process, i.e., raw-water from pond specifically made for storing drinking water, then pass water through coarse-sand, then charcoal, and last fine-sand. The final product was collected in an earthen vessel, and stored in a copper/brass vessels (*Kalash)*. Similarly, all utensils used for worship purposes in India were either made from copper or brass the reason being the same - to make water and other offerings to God free of bacteria and other micro-organisms (8,9).

Due to leaching action, trace amount of copper gets into the water, as well as, water gets ionized – thus it becomes a natural, calorie free, strong anti-oxidant, essential for human body to fight free-radicals or oxides that get generated in the body as a by-product of digestion process, and continuous regeneration and replacement of death cells with new ones. It is also observed by the author that water when kept in a copper vessel for over 24 hours becomes alkalized to pH 8.5, and it is a well-known fact that drinking slightly alkalinized water supports good health. It is to be noted that pH of human blood of a healthy person is maintained from 7.35 to 7.45, and this is tightly controlled by body's internal control mechanism to prevent pH level getting below 7.35 which tends to be an ideal environment for illness to set in. Therefore, it is essential if we are to remain healthy, that we drink alkalinized water and consume food (Earth-minerals) that helps alkalinized the body/blood. Copper plays an important role, also, in the development of our central nervous system. Absorption of ionized water by cells is found to be more effective, and thus beneficial for energizing and revitalizing cells. Ionized water can be either alkaline or acidic depending on the types of minerals present in the water – presence of alkaline minerals, like Calcium, Magnesium, etc., and where acidic ionized water will have acidic minerals, like carbonate, etc. Ionized alkaline water is also known as Electrolyzed Reduced Water (ERW) because it has been shown in laboratory settings to reduce the effects of oxidation. The ability of ionized alkaline water to reduce oxidative damage is referred to as its Oxidation Reduction Potential (ORP). The negative charge of Alkaline Ionized Water reduces oxidation because it contains hydroxyl ions (extra electrons), which is an environment that leads to health. The positive ORP of Acid Ionized Water increases oxidation because it contains hydrogen ions (missing electrons), which is the environment of all disease (10, 11).

II. Modern Concept of Safer Water for Better Health

The World Health Organization (WHO) proposal involves millions of people who will be better able to take care of their health and quality of life by ensuring that all persons have access to good, clean water and adequate hygiene at home or in the community. The 2030 Sustainable Development Goals (SDGs) reflect the global importance of adequate water, sanitation and hygiene for development, poverty reduction and health (12,13).

The significant clauses for SDG 6 includes "ensuring access to water and sanitation to all." are mentioned below:

1.By 2030, universal and equitable access to safe, affordable drinking water must be achieved for all.
2.By 2030, water quality must be improved by reducing pollution and floods, and by minimizing water runoff
3.By 2030, the proportion of untreated sewage that is recycled and reused worldwide must be reduced by half
4.By 2030, there must be greater efficiency in water use in all sectors, and sustainable drainage
5.By 2030, freshwater supply must be addressed and significantly reduced to address water shortage
6.By 2030, integrated water resources management, including cross-border cooperation, must be implemented.
7.By 2030, water and sanitation must be protected and restored in all water-dependent ecosystems, from mountains to forests, wetlands to rivers, waters and lakes
8.By 2030, international collaboration and capacity building should be expanded in water and sanitation activities and programs in developing countries, such as:Water reuse,Desalination,Water efficiency,Waste water treatment,Recycling and reuse technologies.
9..Encourage and strengthen local communities' ownership of water

Inadequate hand washing and inadequate hygiene facilities can lead to the spread of a variety of diseases, including diarrhea and respiratory diseases, which are transmitted through drinking water. Water resources, such as ponds, standing water, waste or containers, and inadequate sewage retention can also contribute to the spread of these diseases, which are spread by vectors, such as mosquitoes. Furthermore, small children are particularly

vulnerable to these diseases, accounting for 13% of the total mortality of children under the age of five. These high disease burdens can be largely alleviated with existing measures and prevention strategies (14).

Primary Diseases	Auxilliary diseases
Diarrhoeal diseases	Arsenicosis
Respiratory infections	Fluorosis
Soil-transmitted helminth infections	Legionellosis
Malaria	Leptospirosis
Trachoma	Hepatitis A and E
Schistosomiasis	Cyanobacterial toxins
Lymphatic filariasis	Lead poisoning
Onchocerciasis	Scabies
Dengue	Spinal injury
Japanese encephalitis	Poliomyelitis
Protein–energy malnutrition	Neonatal conditions and maternal outcomes
Drowning	Other Diseases- Yaws, Dracunculiasis, Leprosy, Tinea.

Table 1: Variety of Diseases caused due to inadequate water, sanitation and hygiene
Source: WHO report 2016

In 2016, it is estimated that nearly two million fatalities and more than one hundred and ninety-four million direct-to-adverse events could have been avoided. This could have been avoided by providing adequate WASH services, such as access to clean drinking water, sanitation, water resources management, and safe waterways(15). A few specific activities that could be implemented to improve health, as well as examples of successful health-promoting measures and cost-benefit analyses are mentioned below

Water security planning (WSP) is the process of assessing and managing risks throughout the entire supply chain of drinking water, from the source water to the end consumer. The World Health Organization (WHO) describes WSP plans as "the most effective method of ensuring the continued safe supply of drinking water" to deliver. (193-195). The World Health Organization (WHO) has established international standards for the use and health of recreational water bodies (196). These standards cover the management, monitoring, and control of potential health risks, such as drowning and injuries, cold, heat, and sunlight, as well as water quality, particularly sewage-contaminated water. Additionally, the WHO Guidelines on the Safe Use of Wastewater, Exudates and Gray Water (34) suggest a risk-based approach to assessment and management, based on health objectives set at an appropriate level for local conditions. The WHO Guidelines on the Quality of Drinking Water (15) serve as a valid basis for national rules and regulations, and water safety standards to protect public health. Furthermore, the WHO Sanitation and health Guidelines (197) summarise the relationship between sanitary conditions and health, providing evidence-based guidance to international, national, and local sanitation policies and programs. Finally, the WHO Guidelines define the role of Health Facilities in Sanitary Policy and Programming to ensure identification and effective Management of Health Risks. Sanitation safety planning (SSP) is a process that uses risk assessment and risk management to implement the World Health Organization (WHO) guidelines for the safe disposal of wastewater, effluents and greywater.Risk assessment and risk management helps prevent exposure to excreta during the entire sanitation chain from the point of origin to the point of final use or disposal (16,17,18).

The Impact of Water on Conflict Around the World

For centuries, water supply and the systems necessary to ensure adequate drinking water have been subject to attack. In many cases, conflicts have taken advantage of people's reliance on water. When water is cut off to a community, children and families often have to depend on unsafe water or abandon their homes in search of a new source. In some cases, this can lead to families having to limit or ration their water intake, while in other cases, they may be forced to consume water that is clearly contaminated and unsafe. Water can be utilized as a weapon in a variety of ways, such as by attacking or obstructing access to water infrastructures and personnel (19,20).

Assaults on Water and Sanitation Infrastructure (W&S) can be both intentional and unintentional, such as the targeting of pipelines or the pouring of concrete into wells. Unintentional attacks, where the aim is to damage or destroy critical civilian infrastructure, can lead to the destruction of W&S systems. Additionally, W&S workers, both humanitarian and local, are often put at risk when operating in conflict areas. Many have been attacked, injured, or killed while attempting to repair critical civilian infrastructure, and even the threat of attack can impede maintenance or repair, resulting in a lack of clean water for a community. Furthermore, humanitarian aid supplies are often blocked from reaching communities or areas in need during conflicts. Finally, when water sources are contaminated, water is often used as a weapon, such as the throwing of dead bodies or animals into wells to contaminate the water (21).

Case study 1: The Water Crisis in Afghanistan and its Impact on the Conflict

The potential for peace in Afghanistan has been hindered by a variety of environmental threats, and these threats are likely to continue to impede progress in the future. These threats are attributed to a variety of factors, ranging from climate and climate change to resource management and human impacts. Water has been a major source of conflict in the country, with the most contentious issue being access to water. In 2013, the United Nations Endowment for Democracy (UNEP) reported that 70–80% of Afghans depend on natural resources for their livelihoods, including agriculture, animal husbandry, and artisan mining. Afghanistan is a landlocked country, meaning that if water was adequately captured and managed, it could provide adequate rainfall for all agricultural output. However, due to the ongoing conflict, corruption, and economic hardship, much of Afghanistan's water has become unusable or has been diverted away from the country. Furthermore, access to drinking water is not available to many people, with the Ministry of Urban Development reporting that in 2017 that over 70% of the population in Kabul did not have access to drinking water.

Case study 2: Russia- Ukraine War

The Russian conflict in Ukraine since 2022 has caused extensive damage to the water and sanitation systems of the country, with civilian water supplies and treatment being subject to collateral damage. These systems have been used as weapons in targeted attacks and have been subject to large-scale population movements and reduced capacity due to water operators taking up arms in order to defend their country. The consequences of this situation are far-reaching, both in the short and long term, and have implications for Ukraine's health, agriculture, energy, and economic systems.

Case study 3: Manipur Crisis

On May 3, 2023, a Kuki tribe organised a protest march in Manipur, a northeastern Indian state, in response to the recognition of a majority of Meitei communities as Scheduled Tribes. This march led to a violent conflict with the non-Tribal Meitei group. As of May 16, the situation has caused an estimated 7,900 refugees to flee to Mizoram, Assam, and Myanmar, with an additional 300 refugees reported to have crossed the border into Myanmar. Additionally, reports of refugees fleeing to Manipur and Mizoram have been received. As of May 12, an estimated 14,700 individuals (4,025 family members) required humanitarian assistance in 101 relief camps across the state. The primary needs of those in need include access to food and shelter, water, sanitation, and hygiene, as well as psychosocial assistance and protection. Prior to the outbreak of violence, Manipur State had been suffering from water shortages, and local residents had been heavily reliant on private suppliers who had been selling water at exorbitant prices.

III. Conclusion

"Be the change" is a global campaign that encourages individuals and communities to make positive changes in their lives to improve their water use, consumption and management practices. These pledges will contribute to the implementation of the Water Action Agenda, in addition to the larger commitments made by governments, businesses, organizations, institutions and coalitions.

In March of 2023, the world came together to participate in the United Nations Water Conference, which was convened by the United Nations General Assembly. General Assembly Resolution 75/212 outlines the parameters of the results of the Water Conference. As stated by the President, the outcome of the Water Conference is expected to be a game-changer.

A game-changer is a catalyst for building resilience to water, climate change, food and energy shocks, as well as economic, environmental, social and policy shifts. Ultimately, the aim is to strengthen collaboration to bring benefits across actors, industries and scales, and serve as a means to sustainable development (22).

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