

Exploring the Importance and Impact of Quality Water on Human Health

Ihunwo, Confidence Chidera

M.Sc Student, Department of Healthcare Management, School of Health Sciences and Medicine, Charisma University, Turks and Caicos Islands, British West Indies.

Abstract : *Water plays many important roles in our body. It is the major part of most of the body's cells except for fat cells and it also cushions and lubricates the brain and the joints. It transports nutrients and carries waste away from the body cells. This paper discusses the importance and impact of quality water on human health. The paper relies on qualitative content/document analysis of relevant empirical materials gotten from secondary sources. Findings reveal that the composition of water in human body is 85% in the brain, 80% in the blood and 70% in the muscle. The research findings also show that polluted water has negative effects on human life. The paper argues that efforts to improve or maintain a certain water quality often compromise between the quality and quantity demands of different users. It is advised that one should take the recommended quantity of water daily, which is a minimum of half your body weight, in ounces/milligrams.*

Keywords: Quality Water, Human Health, Water Pollution.

1. INTRODUCTION

Water (H₂O) is a vital component to every living organism in the world, especially the human species. Water is a significant natural supply used for drinking and other evolving purposes in our lives (Bibi et al., 2016). Safe drinking water is compulsory for human health all terminated the world. Animation a universal solvent, water is a major basis of pollution. According to the World Health Organization (WHO) 80% of ailments are water borne. Ingestion of quality water in various countries does not meet the WHO principles (Khan et al., 2013). 3.1% deaths occur due to the unsanitary and deprived quality of water (Pawari & Gawande, 2015). There can be no life on earth without water. Why is water so important? This is because about 60 percent of our body weight is made up of water. Our bodies use water in all the cells, organs, and tissues, to help regulate body temperature and maintain other bodily functions. Because our bodies lose water through breathing, sweating, and digestion, it is crucial to rehydrate and replace water by drinking fluids and eating foods that contain water (Velayutham, 2019).

According to Hossain (2015), water is the main constituent of the human body. It is normally about 60% of body weight in adult males, and is slightly lower, about 50-55%, in females due to their higher proportion of body fat. The muscles and the brain are about 75% water, the blood and the kidneys are about 81%, the liver is about 71%, the bones are about 22% and adipose tissue is about 20%. The body requires sufficient water to survive and function properly. Humans cannot live without drinking water for more than a few days – depending on weather, activity levels and other factors – whereas other nutrients may be neglected for weeks or months. Although commonly it is treated rather trivially, no other nutrient is more essential or is needed in such large amounts.

In 2017, 71% of the global population (5.3 billion people) used a safely managed drinking-water service – that is, one located on premises, available when needed, and free from contamination. 90% of the global population (6.8 billion people) used at least a basic service. A basic service is an improved drinking-water source within a round trip of 30 minutes to collect water. 785 million people lack even a basic drinking-water service, including 144 million people who are dependent on surface water (WHO, 2019). Believe it or not, the human body weight is about 60 percent water, according to the U.S. Geological Survey (Migala, 2020).

Water plays many important roles in our body. It is the major part of most of the body's cells (except for fat cells) and it also cushions and lubricates the brain and the joints. It transports nutrients and carries waste away from the body cells. It also helps to regulate body temperature by redistributing heat from active tissues to the skin and cooling the body through perspiration. Most of the water in the body is found within the cells of the body (about two thirds is in the intracellular space), and the rest is found in the extracellular space, which consists of the spaces between cells (the interstitial space) and the blood plasma (Hossain, 2015). It is argued here that the effort to improve or maintain a certain water quality is often a compromise between the quality and quantity demands of different users.

2. CONCEPTUALISATION OF WATER QUALITY

Water is a major factor in shaping our landscape. Through the processes of erosion and sediment transport, water forms many surface feature such as valleys, flood plains, deltas, and beaches. Water also forms a subsurface feature such as caves. Natural wonders such as the Grand Canyon in the Unites States were, and are being, carved by water. Streams from upland areas carried much of the sand that is located on ocean beaches. Water is a renewable resource. However, it is not always available when or where it is needed, and it may not be of suitable quality for intended uses. Although we commonly take for granted that clean and abundant water is as close

as the nearest faucet, water resources can be depleted or contaminated with pollutants (Vandas et al., 2002). Water quality describes the condition of the water, including chemical, physical, and biological characteristics, usually with respect to its suitability for a particular purpose such as drinking or swimming. Water quality is measured by several factors, such as the concentration of dissolved oxygen, bacteria levels, the amount of salt (or salinity), or the amount of material suspended in the water (turbidity) (Florida Keys National Marine Sanctuary, 2020).

Water quality is a term used here to express the suitability of water to sustain various uses or processes. Any particular use will have certain requirements for the physical, chemical or biological characteristics of water; for example, limits on the concentrations of toxic substances for drinking water use, or restrictions on temperature and pH ranges for water supporting invertebrate communities. Consequently, water quality can be defined by a range of variables which limit water use. Although many uses have some common requirements for certain variables, each use will have its own demands and influences on water quality (Meybeck et al., 1996).

The importance of water to human health and environment cannot be over emphasized. What is more importantly is the concept of clean water or the quality of the water. It is estimated that each person on earth is required to have 20 to 50 liters of clean safe water each and every day. This clean water is to be used for drinking, cooking, simple hygiene, etc. (National Academy of Sciences, 2016). There are a number of different infectious agents detrimental to human health that grow in contaminated/unsanitary water which can cause a number of waterborne illnesses; such as cholera, hepatitis, typhoid, and diarrhea (Vestergaard, 2016). Take for example, diarrheal diseases from cholera, this agent and illness is responsible for 1.8 million deaths worldwide (National Academy of Sciences, 2016). These deaths can be preventable with the proper knowledge, education, and infrastructure put in place.

Water quality is affected by a wide range of natural and human influences. The most important of the natural influences are geological, hydrological and climatic, since these affect the quantity and the quality of water available. Their influence is generally greatest when available water quantities are low and maximum use must be made of the limited resource; for example, high salinity is a frequent problem in arid and coastal areas. If the financial and technical resources are available, seawater or saline groundwater can be desalinated but in many circumstances this is not feasible. Thus, although water may be available in adequate quantities, its unsuitable quality limits the uses that can be made of it. Although the natural ecosystem is in harmony with natural water quality, any significant changes to water quality will usually be disruptive to the ecosystem (Meybeck et al., 1996).

In some bodies of water, the concentration of microscopic algae and quantities of pesticides, herbicides, heavy metals, and other contaminants may also be measured to determine water quality. Although scientific measurements are used to define water quality, it is not a simple thing to say “that water is good” or “that water is bad.” So, the determination is typically made relative to the purpose of the water – is it for drinking or to wash a car with or for some other purpose? Poor water quality can pose a health risk for people. Poor water quality can also pose a health risk for ecosystems (Florida Keys National Marine Sanctuary, 2020).

Water quality is a term used to describe water’s chemical, physical and biological characteristics. The term is usually used to describe water’s suitability for a particular purpose (i.e., drinking water, recreation, aquatic life) (United States Geological Survey (USGS), August 2005d).

Water quality can be defined as a measure of the suitability of water for a particular use, based on the following characteristics:

- **Physical:** temperature, color, light, sediment suspended in the water.
- **Chemical:** dissolved oxygen, acidity (pH) level, salinity, nutrients, and other contaminants.
- **Biological:** bacteria, algae, and phytoplankton.

These parameters of water quality are relevant not only to assess surface water like the ocean, lakes, and rivers but also for groundwater and industrial processes (Bahagijoin, 2020).

3. DISCUSSION

3.1 Importance of Quality Water to Human Body

Clean water is an absolute necessity for sanitation and hygiene. It is also important for the health, social, and economic development around the world (Inter Press Service, 2014). Three-quarters of our world is covered with water and the human body is mostly made up of water. Water has a vital importance for all living things and some of the main functions in the human body can be summarized as follows; it is a biological solvent that provides both the transport and dissolution of vitamins and minerals in the body; it is important in regulating body temperature; facilitates the work of the kidneys and other organs, protects and acts as a cushion; plays a fundamental role in moisturizing the skin, removing toxins and cleansing the body; it supports the conversion of nutrients in the body into energy and also helps the absorption of nutrients; water is also the main ingredient of carbohydrates, fats and proteins in the human body. In addition to all these, water has an important place in performing many vital activities such as circulation, excretion and reproduction (Akin & Akin, 2007), 80-90% of our blood and 75% of our muscles are made up of water (Çepel &

Ergün, 2003). Water is an indispensable element of life and we feel uncomfortable when we are dehydrated even for a short time. When we lose very important blessings like the water we have, we begin to realize how water is a precious substance (Kılıç, 2020).

Having adequate water in your body is critical to nearly every part of it. Not only will maintaining your recommended daily intake help you to maintain your current state of good health, it could also improve it in the long run. The amount of water you need depends on the environment and climate you live in, how physically active you are, and whether you are suffering from an illness, ailment or any other health problems (Velayutham, 2019). Water is involved in all bodily functions: digestion, assimilation, elimination, respiration, maintaining temperature (homeostasis) integrity and the strength of all bodily structures. Today, the water is polluted with hundreds of toxins and impurities. Water pollution is the leading worldwide cause of deaths and diseases and accounts for the deaths of more than 14,000 people daily (Jabeen et al., 2011).

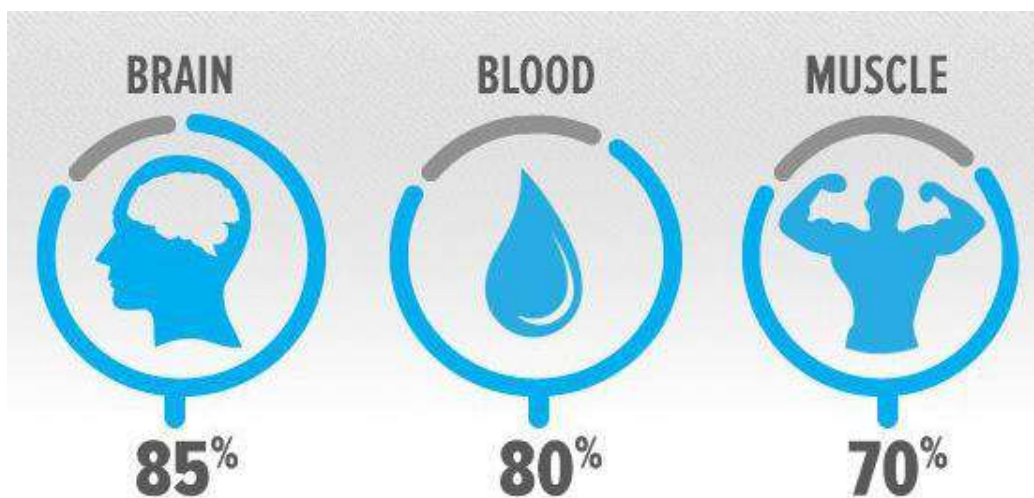


Figure 1 H₂O composition in human body

Source: Rahman Akter (2020).

Water, although an absolute necessity for life can be a carrier of many diseases. Paradoxically, the ready availability of water makes possible the personal hygiene measures that are essential to prevent the transmission of enteric diseases. Infectious water-related diseases can be categorized as waterborne, water-hygiene, water-contact and water-habitat vector diseases. Some water-related diseases, however, may fall into more than one category. Waterborne infectious diseases are those in which the pathogen, or causative organism, is present in water and ingested when the water is consumed. Most of the pathogens involved are derived from human feces, and the diseases transmitted by consumption of fecally contaminated water are called “fecal-oral” diseases. All of the fecal-oral diseases can also be transmitted through a media other than water, for example fecally contaminated food, fingers or utensils. The principal fecal-oral diseases are cholera, typhoid, shigellosis, amoebic dysentery, hepatitis A and various types of diarrhea (Chapman, 1996)

Water is essential to life. It is part of the physiological process of nutrition and waste removal from cells of human beings. Quality water is important to the human body in the following ways:

3.1.1 Water Protects Tissues, Spinal Cord, and Joints

Water does more than just quench your thirst and regulate your body's temperature; it keeps the tissues in your body moist. You know how it feels when your eyes, nose, or mouth gets dry. Keeping your body hydrated helps it retain optimum levels of moisture in these sensitive areas, as well as in the blood, bones, and brain. In addition, water helps protect the spinal cord, and it acts as a lubricant and cushion for your joint (Migala, 2020). Thiyagarajan Velayutham observes that staying hydrated is critical to maintaining a normal body temperature. Our bodies lose water when we sweat, and are in hot environments. Sweat keeps our bodies cool, but our body temperatures increases when we do not replenish the water we lose. That lack of water causes dehydration, which in turn causes levels of electrolytes and plasma to drop (Velayutham, 2019). Water consumption helps lubricate and cushion your joints, spinal cord, and tissues. This will help you enjoy physical activity and lessen discomfort caused by conditions like arthritis (Silver, 2020).

3.1.2 Water Helps in Removal of Waste

Adequate water intake enables your body to excrete waste through perspiration, urination, and defecation. Water helps your kidneys remove waste from your blood and keep the blood vessels that run to your kidneys open and filter them out, according to the National

Kidney Foundation. Water is also important for helping prevent constipation, points out the University of Rochester Medical Center. However, as research notes, there is no evidence to prove that increasing your fluid intake will cure constipation (Migala, 2020). Clean, fresh and safe drinking water also helps in getting the body rid of all kinds of toxins, whether they are created due to bodily reactions, obtained from outside sources or ones that occur because of the consumption of contaminated water (Rahman & Akter, 2020).

3.1.3 Water Prevents Dehydration

The human body loses fluids when it engages in vigorous exercise, sweat in high heat, come down with a fever or contract an illness that causes vomiting or diarrhea. If the human body is losing fluids for any of these reasons, it is important to increase the fluid intake so that you can restore your body's natural hydration level. Your doctor may also recommend that you drink more fluids to help treat other health conditions, like bladder infections and urinary tract stones. If you're pregnant or nursing, you may want to consult with your physician about your fluid intake because your body will be using more fluids than usual, especially if you're breastfeeding (Migala, 2020). Dehydration is the result of your body not having enough water. And because water is imperative to so many bodily functions, dehydration can be very dangerous. Severe dehydration can result in a number of severe complications, including: swelling in the brain, kidney failure, and seizures. Make sure you drink enough water to make up for what's lost through sweat, urination, and bowel movements to avoid dehydration (Silver, 2020).

3.1.4 It helps maximize physical performance

Drinking plenty of water during physical activity is essential. Athletes may perspire up to 6 to 10 percent trusted source of body weight during physical activity. Hydration also affects your strength, power, and endurance. You may be more susceptible to the effects of dehydration if you're participating in endurance training or high-intensity sports such as basketball. Negative effects of exercise in the heat without enough water can include serious medical conditions, like decreased blood pressure and hyperthermia. Extreme dehydration can cause seizures and even death (Silver, 2020). Drinking plenty of water while working out, taking part in sports or just being on the move is essential. Keeping ourselves hydrated also affects our strength, power, and endurance (Velayutham, 2019).

3.1.5 Water Aids in Digestion

Water is important for healthy digestion. Water helps break down the food you eat, allowing its nutrients to be absorbed by your body. After you drink, both your small and large intestines absorb water, which moves into your bloodstream and is also used to break down nutrients. As your large intestine absorbs water, stool changes from liquid to solid, according to the National Institute for Diabetes and Digestive and Kidney Diseases. Water is also necessary to help you digest soluble fiber. With the help of water, this fiber turns to gel and slows digestion (Migala, 2020). Contrary to what some believe, experts confirm drinking water before, during, and after a meal will help your body break down the food you eat more easily. This will help you digest food more effectively and get the most out of your meals (Silver, 2020).

3.2 Effects of Water Pollution to Human Health

The quality of water to be drunk safely by people should contain sufficient O₂ and necessary minerals and should be clear (Akin, 2009). Considering that one liter of wastewater pollutes eight liters of clean water (Aksungur & Firidin, 2008) and makes it unusable, it is better understood to what extent the natural cycle of water resources is in danger. Considering also that the number of healthy and deprived people of water today is approximately 1.4 billion (Çolakoğlu, 2009), it is better understood how important the issue is. Pollution of rivers, lakes, groundwater and seas is mostly caused by human activities and consequently, the natural balance of ecosystems deteriorates. The main pollutants encountered in water are acids and alkalis, detergents, household wastes and fertilizers, food industry wastes, various gases, heat, various metals, nutrients, oils and dispersants, organic toxic wastes, pathogens and pesticides (Göksu & Ziya, 2015). Water pollution does not only stay in water, it passes to the soil and from the soil to plants, vegetables and fruits through irrigation, and these harmful wastes also pass to the animals that drink from these polluted water and the sustainability of food resources is negatively affected.

Pollution may result from point sources or diffuse sources (non-point sources). There is no clear-cut distinction between the two, because a diffuse source on a regional or even local scale may result from a large number of individual point sources, such as automobile exhausts. An important difference between a point and a diffuse source is that a point source may be collected, treated or controlled (diffuse sources consisting of many point sources may also be controlled provided all point sources can be identified). The major point sources of pollution to freshwaters originate from the collection and discharge of domestic wastewaters, industrial wastes or certain agricultural activities, such as animal husbandry. Most other agricultural activities, such as pesticide spraying or fertilizer application, are considered as diffuse sources (Meybeck & Helmer, 1996).

Some of the factors that will have a pollutant effect on surface waters can be listed as follows: disease-causing organisms, organic pollutants, industrial wastes, synthetic detergents, radioactivity, pesticides, chemical pollutants, inorganic salts, artificial and natural agricultural fertilizers, waste heat. Some of the pollution in water resources can be understood by appearance. But taste, smell,

pollution caused by microorganisms, heavy metals, nitrates, radon and many chemicals can only be understood by laboratory tests. For this reason, analysis of potable water should be done regularly (Kilic, 2020). Drinking or using polluted water can result in health problems, such as digestive issues, toxicity and death, or chronic toxicity and neurological issues from more serious chemical pollution. Waterborne pathogens are the most common cause of illness in humans from polluted water. Diseases from the consumption of contaminated water include giardia, typhoid, and cholera. Accidental and illegal leaks from sewage facilities and runoff from urban areas and agriculture farms occur even in developed nations, affecting everyone's water quality. The United Nations reports that 85,700 children die from diarrhea caused by contaminated water (Cohen, 2021).

The paper identifies three key disease related effects of polluted water on human health, which include:

3.2.1 Diarrhea

Globally, at least 2 billion people use a drinking water source contaminated with feces. Contaminated water can transmit diseases such diarrhea, cholera, dysentery, typhoid, and polio. Contaminated drinking water is estimated to cause 485,000 diarrheal deaths each year. By 2025, it is projected by the World Health Organization that half of the world's population will be living in water-stressed areas. In least developed countries, 22% of health care facilities have no water service, 21% no sanitation service, and 22% no waste management service (WHO, 2019). In another report by the Inter Press Service, diarrhea is considered to be the most important public health problem with its relation to unclean water. The numbers are remarkable, four billion cases of diarrhea a year, 1.8 million deaths; of these deaths, approximately 90% are said to be under the age of five (Inter Press Service, 2014).

According to the World Health Organization report, some 829,000 people are estimated to die each year from diarrhea as a result of unsafe drinking-water, sanitation, and hand hygiene. Yet diarrhea is largely preventable, and the deaths of 297,000 children aged less than 5 years could be avoided each year if these risk factors were addressed. Where water is not readily available, people may decide that hand-washing is not a priority, thereby adding to the likelihood of diarrhea and other diseases. The report further concludes that diarrhea is the most widely known disease linked to contaminated food and water but there are other hazards. In 2017, over 220 million people required preventative treatment for schistosomiasis – an acute and chronic disease caused by parasitic worms contracted through exposure to infested water (WHO, 2019).

3.2.2 Malaria

Another disease that is the leading killer worldwide and is predominant in Africa and other developing nations is malaria, due to the use of polluted or contaminated water (UNICEF, 2016). Malaria is responsible for approximately 90% of the one million deaths worldwide that occur in Africa. Nine out of ten cases of malaria worldwide occur specifically in sub-Saharan Africa. The implications of malaria are not just medically relating but economically; economic growth has been slowed due to malaria in Africa by 1.3% per year; this equates to a compounded rate of 32% of economic decline in the past 35 years (Omana, 2019). Across all empirical studies consulted for this paper on the comparison of malaria infections diagnosed by microscopy among individuals with different water and sanitation (WS) access in different countries, it was revealed that the prevalence rates of malaria among the unprotected water users (22.6%) and piped water users (7.5%) were both significantly lower than the prevalence rate among the protected water users (22.6% versus 26.8%, $p < 0.001$; 7.6% versus 26.8%, $P < 0.001$). However, this trend was not always consistent in all the surveys (Yang et al., 2020).

3.2.3 Transmission of Fecal Diseases

Another negative impact of unclean water is how contaminated water serves as a means for the transmission of fecal diseases. Take for example India and of course, some other developing nations, three out of five individuals will defecate in the open in rural villages which in turn contaminates the water. These poor sanitary practices are responsible for one out of ten deaths and causes lose to approximately six percent gross domestic product annually (World Bank, 2016). This viscous cycle repeats itself over and over, robbing the developing nations of opportunities from developing to their full potential economically (Khalifa & Bidaisee, 2018). Incidents like this which create unsanitary water sources have been linked to numerous outbreaks of fecal oral diseases, such as cholera and typhoid (Lenntech, 2016). Not only is clean water needed to avoid infectious agents from deteriorating life, but it is also an absolute necessity for the physiological functions of the body.

4. CONCLUSION AND RECOMMENDATIONS

The healthy water drunk and used should be colorless, odorless and tasteless water; its chemical content should contain some basic elements needed by the body such as calcium, magnesium, and sodium; they should not contain nitrite, nitrate, organic matter, chemicals, heavy metals and disease causing microorganisms. The amount of water one needs depends on a variety of factors, which include climate one lives in, how physically active you are, and whether you are experiencing an illness or have any other health problems all affect recommended intake.

Water quality is affected by a wide range of natural and human influences. The most important of the natural influences are geological, hydrological and climatic, since these affect the quantity and the quality of water available. Their influence is generally greatest when available water quantities are low and maximum use must be made of the limited resource; for example, high salinity

is a frequent problem in arid and coastal areas. The quality of water may be described in terms of the concentration and state (dissolved or particulate) of some or all of the organic and inorganic material present in the water, together with certain physical characteristics of the water. It is determined by *in situ* measurements and by examination of water samples on site or in the laboratory (Bartram & Balance, 1996). Factors such as technological developments, economic growth and welfare level, demographic changes, differences in nutrition and social and cultural values are thought to affect water use habits (Kilic, 2020).

It is therefore recommended that one has to carry a water bottle to wherever one goes. This way you can drink whenever the need strikes. One should also keep track of daily water intake according to prescription. It is also recommended that one should keep taking sips of water when one feels the need. Make sure you consume the optimum amount every day, which is a minimum of half your body weight, in ounces/milligrams.

References

- Akın, G. (2009). Ecology - Ecology and Environmental Problems. Ankara: Tiydem Yayıncılık.
- Aksungur N., & Firidin, S. (2008). Use of Water Resources and Sustainability. *Araştırma Bülteni*; 8(2):9–11.
- Akın, M., Akın, G. (2007). Suyun Önemi, Türkiye’de Su Potansiyeli, Su Havzaları ve Su Kirliliği. *Ankara Üniversitesi Dil ve Tarih–Coğrafya Fakültesi Dergisi*; 47(2):105–118.
- Bahagjain, M. (2020). The Importance of Water Quality and Monitoring. Available on <https://waste4change.com/blog/lets-talk-about-water-the-importance-of-water-quality-and-monitoring/>
- Bartram, J., & Balance, R. (1996). Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes. United Nations Environment Programme and the World Health Organization
- Bibi, S., Khan, R. L., Nazir, R., et al. (2016). Heavy metals in drinking water of LakkiMarwat District, KPK, Pakistan. *World applied sciences journal*; 34(1):15-19.
- Center & Global Development (2016) Education and the developing world.
- Çepel, N., & Ergün, C. (2003). The Importance of Water and its Ecological Problems.
- Chapman, D. (Ed.). (1996). Water Quality Assessments. A Guide to the Use of Biota, Sediments and Water in Environmental Monitoring. 2nd edition. Chapman & Hall, London.
- Cohen, S. (2021). The Consequences and Effects of Water Pollution. Available on <https://www.interfaithsustain.com/effects-of-water-pollution/>
- Göksu, M., & Ziya, L. (2015). Water pollution. Ankara: Academician Bookstore.
- Inter Press Service (2014). UN Vows to Eliminate Open Defecation by 2025 - Our World.
- Jabeen, S. Q., Mehmood, S., Tariq, B., et al. (2011). Health impact caused by poor water and sanitation in district Abbottabad. *J Ayub Med Coll Abbottabad*; 23(1): 47-50.
- Kilic, Z. (2020). The importance of water and conscious use of water. *International Journal of Hydrology*, Volume 4 Issue 5.
- Khan, N., Hussain, S. T., Saboor, A., et al. (2013). Physiochemical investigation of the drinking water sources from Mardan, Khyber Pakhtunkhwa, Pakistan. *International journal of physical sciences*; 8(33):1661-71.
- Khalifa, M., & Bidaisee, S. (2018). The Importance of Clean Water. *Sch J Appl Sci Res*. Vol: 1, Issue: 7 (17-20).
- Lenntech, (2016). Water treatment & purification: water Borne diseases.
- Meybeck, M., & Helmer, R. (1996). An Introduction to Water Quality. In D. Chapman (Ed.). *Water Quality Assessments - A Guide to Use of Biota, Sediments and Water in Environmental Monitoring - Second Edition*.
- Meybeck, M., Kuusisto, E., Mäkelä, A., & Mälkki, E. (1996). Water Quality. In J. Bartram & R. Balance (Eds.). *Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes*. United Nations Environment Programme and the World Health Organization
- Migala, J. (2020). 7 Health Benefits of Water Backed by Scientific Research. Available on <https://www.everydayhealth.com/water-health/water-body-health.aspx>
-

National Academy of Sciences. (2016). Safe Drinking Water is Essential: Why is Safe Water Essential?

Omana, J. (2009) Social marketing and the fight against malaria in Africa: population services international (PSI) and insecticide treated nets (ITNS). *East Afr J Public Health* 6: 317- 325.

Pawari, M. J., & Gawande, S. (2015). Ground water pollution & its consequence. *International journal of engineering research and general science*; 3(4):773-76.

Rahman, H., & Akter, R. (2020). Importance of Safe Drinking Water for Human Life. Research: Molecular & Cellular Clinical Biochemistry, Volume 01 Issue 01.

Root, E., & Rodd, J., Yunus, M., & Emch, M. (2013). The Role of Socioeconomic Status in Longitudinal Trends of Cholera in Matlab, Bangladesh, 1993–2007. *PLoS Negl Trop Dis* 7: e1997.

See Florida Keys National Marine Sanctuary. (2020). Available on <https://floridakeys.noaa.gov/about/aboutsite.html>

Silver, N. (2020). Why Is Water Important? 16 Reasons to Drink Up

UNICEF. (2016) Water, Sanitation and Hygiene: Common water and sanitation-related diseases.

United States Geological Survey (USGS). (2005d). Water Science: Water Quality. Available on <http://ga.water.usgs.gov/edu/waterquality.html>.

Vandas, S. J., Winter, T. C., & Battaglin, W. A. (2002). Water and the Environment. American Geological Institute.

Velayutham, T. (2019). The importance of water in our daily lives. Available on <https://www.indiahomehealthcare.com/blogpost/the-importance-of-water-in-our-daily-lives/>

Vestergaard. (2016). Drinking contaminated water can lead to waterborne diseases.

The World Bank. (2016). Ending Open Defecation and Achieving a Clean and Healthy Rural India.

World Health Organisation. (2019). Drinking-water. Available on <https://www.who.int/news-room/fact-sheets/detail/drinking-water>

World Health Organization and UNICEF. (2005). Water For Life Making It Happen: Decade For Action 2005–2015. WHO Library Cataloguing-in-Publication Data

World Vision (n.d.). Transform A Child's Life Today.

Yang, D., Yang, H., Wuc, B., Yan, D., Menglin, L., Qian, Y., Liting, H., Yaming, C., & Yang, L. (2020). Drinking water and sanitation conditions are associated with the risk of malaria among children under five years old in sub-Saharan Africa: A logistic regression model analysis of national survey data. *Journal of Advanced Research* 21, 1–13