ISSN: 2278-4632
Vol-10 Issue-6 No. 13 June 2020

"An Overview: Contamination in drinking water is the major health issues in Human"

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Abstract: The studies are continue for the adverse effects of contaminated drinking water. The data regarding water pollution and human health was obtained and compiled through a thorough review of various published research articles of international reputed journal and relevant books. Water covers about 70% Earth's surface. Safe drinking water is a basic need for all humans. The WHO reports that 80% diseases are waterborne. Industrialization, discharge of domestic waste, radioactive waste, population growth, excessive use of pesticides, fertilizers and leakage from water tanks are major sources of water pollution. These wastes have negative effects on human health. Different chemicals have different affects depending on their locations and kinds. Bacterial, viral and parasitic diseases like typhoid, cholera, encephalitis, poliomyelitis, hepatitis, skin infection and gastrointestinal are spreading through polluted water. It is recommended to examine the water quality on regular basis to avoid its destructive effects on human health. Domestic and agriculture waste should not be disposed of without treating.Bacterial, viral and parasitic diseases like typhoid, cholera, encephalitis, poliomyelitis, hepatitis, skin infection and gastrointestinal are spreading through polluted water. It is recommended to examine the water quality on regular basis to avoid its destructive effects on human health.

Keywords

Water pollution, sources of water pollution, harmful chemicals, infectious diseases

Introduction: If drinking water contains unsafe levels of contaminants, it can cause health effects, such as gastrointestinal illnesses, nervous system or reproductive effects, and chronic diseases such as cancer.The onslaught of human activities has resulted in the rampant pollution of almost every type of fresh water source available to us. From small water bodies like ponds and lakes to the oceans of the world, water pollution is prevalent everywhere.Currently, more than one-sixth of the country's groundwater supply is overused, according to India's official Ground Water Resources Assessment. Furthermore, 80% of the country's surface water is polluted. These problems give rise to numerous waterborne diseases which if not treated properly and on time can prove to be fatal. One of the proven methods is to invest in a high-quality water purifier. It will help defend you and your family against harmful waterborne diseases.There are the following 10 diseases that are caused by water pollution:

1. Dysentery
2. Arsenicosis. ...
3. Polio (Infantile Paralysis) ...
4. Trachoma (Eye Infection) ...
5. Typhoid fever. ...
6. Schistosomiasis. ...

ISSN: 2278-4632
Vol-10 Issue-6 No. 13 June 2020

7. Cholera. ...
8. Diarrhoea.
9. Malaria
10. Lead Poisoning

Infants, children, elderly people, and people with weakened immune systems are more likely to get sick or even die from pathogens in drinking water. The U. S. Environmental Protection Agency (EPA) requires public water systems to regularly test water for total coliform bacteria and E. coli.Symptoms of gastrointestinal illness from contaminated water can include diarrhea, abdominal cramps, nausea and vomiting. Those symptoms can take 24 to 48 hours to develop, says Forni, so you might not get sick for a day or two after drinking bad water. Here are 12 of the most dangerous contaminants that are commonly found in America's water supply.

1. Lead.
2. Copper
3. Chlorine
4. Arsenic
5. Nitrate.
6. Radioactive substances
7. Fluoride.
8. Mercury
9. Perchlorate
10. PFOA (Perfluorooctanoic Acid)
11. Mangnese
12. Microorganism

Owners of private wells are responsible for ensuring that their water is safe from contaminants. .The presence of contaminants in water can lead to health issues, including gastrointestinal illness, reproductive problems, and neurological disorders.

What Can We Do?

Water treatment has been around for a long time. Several methods were used for purifying water, such as boiling and filtering the water through sand and even charcoal. Back then, the reasons for purifying water were related to taste, as there was no practical procedure to remove various micro-biological and chemical contaminants that we see today.Now, there are several different water treatment methods available that can help protect you and your family from some, most or all of the named contaminants in this article. The most effective method is probably a water filtration system. These systems are specially designed to remove certain contaminants from water in different stages, using different technologies. As the quality of drinking water in the US continues to worsen, you must explore different avenues to keep you and your family safe from the adverse health effects of these pollutants. Installing a quality water filtering system is possibly the best way to achieve this.

The United States has one of the safest public drinking water supplies in the world. Over 286 million Americans get their tap water from a community water system [(1)]. The US Environmental Protection Agency (EPA) regulates drinking water quality in public water systems and sets maximum concentration levels for water chemicals and pollutants.Sources of drinking water are subject to contamination and require appropriate treatment to remove disease-causing contaminants. Contamination of drinking water supplies can occur in the source water as well as in the distribution system after water treatment has already occurred. There are many sources of water contamination, including naturally occurring chemicals and minerals (for example, arsenic, radon, uranium), local land use practices (fertilizers, pesticides, concentrated feeding operations), manufacturing processes, and sewer

ISSN: 2278-4632
Vol-10 Issue-6 No. 13 June 2020

overflows or wastewater releases.The presence of contaminants in water can lead to adverse health effects, including gastrointestinal illness, reproductive problems, and neurological disorders. Infants, young children, pregnant women, the elderly, and people whose immune systems are compromised because of AIDS, chemotherapy, or transplant medications, may be especially susceptible to illness from some contaminants.For a complete listing of water-related surveillance data, the CDC's Surveillance Reports for Drinking Water-associated Disease & Outbreaks can be studied.

It is reported that 75 to 80% water pollution is caused by the domestic sewage. Waste from the industries like, sugar, textile, electroplating, pesticides, pulp and paper are polluting the water [9]. Polluted river have intolerable smell and contains less flora and fauna. 80% of the world's population is facing threats to water security [8].Large amount of domestic sewage is drained in to river and most of the sewage is untreated. Domestic sewage contains toxicants, solid waste, plastic litters and bacterial contaminants and these toxic materials causes water pollution. Different industrial effluent that is drained in to river without treatment is the major cause of water pollution [9]. Hazardous material discharged from the industries is responsible for surface water and ground water contamination. Contaminant depends upon the nature of industries. Toxic metals enter in to water and reduced the quality of water [10]. 25% pollution is caused by the industries and is more harmful [11].Increasing population is creating many issues but it also plays negative role in polluting the water [10]. Increasing population leads to increase in solid waste generation [12]. Solid and liquid waste is discharged in to rivers. Water is also contaminated by human excreta. In contaminated water, a large number of bacteria are also found which is harmful for human health [11]. Government is incapable to supply essential needs to citizens because of increasing number of population. Sanitation facilities are more in urban areas than rural areas. Polythene bag and plastic waste is a major source of pollution. Waste is thrown away by putting it in to plastic bags [11]. It is estimated that three core people of urban areas defecate in open. 77% people are using flush latrines and 8% are using pit latrines. Urbanization can cause many infectious diseases. Overcrowding, unhygienic conditions, unsafe drinking water are major health issues in urban areas. One quarter of urban population is susceptible to disease [9].

Sources of water contamination

There are various environmental factors, such as landscape, weather, and a season that affect the occurrence of foodborne pathogens in water samples. Different irrigation systems in agriculture have been correlated with increased incidence of foodborne infections [21]. In surface waters, *Esherichia coli* , *Listeria monocytogenes* , *Salmonella* are found more frequently in areas where agriculture is practiced along with animal husbandry [22,23]. *Listeria monocytogenes* was detected from surface water that was in proximity to dairy farm [24].

Leakage or seepage in septic tanks or inappropriate sewage treatments results in pollution of groundwater. Bacteria from these sources enter wells that are either open at the land surface or not watertight. When there is any natural disaster, water is the first to be affected. Rodents, insects, animals or plant parts entering the well are other sources of contamination [25]. Wells not having water-tight sheath can be

ISSN: 2278-4632
Vol-10 Issue-6 No. 13 June 2020

contaminated by bacteria infiltrating to the water through the soil near the well. Human and animal fecal wastes, agricultural products, such as pesticides and fertilizers, improper disposal of chemicals, natural occurring floods, and other disastrous events can contaminate drinking water [26]. These agricultural compounds have degraded the quality of surface water resources by causing nitrate contamination. Heavy metals like cadmium, lead, mercury and zinc are being reported in groundwater in different areas of India [27] (**Figure 1**).

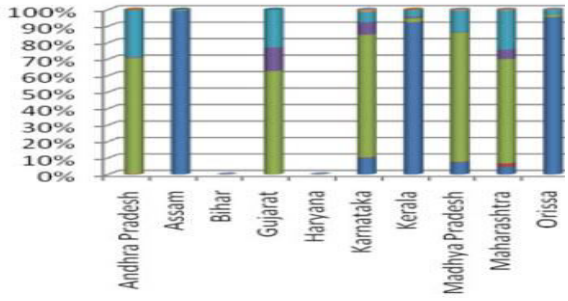

Figure 1: Percentage of affected contamination

Figure 1: Percentage of affected habitations with chemical contamination

Drinking water is contaminated with toxic pathogens, and chemicals; at last count over 4,000 chemicals have been found. Wastes from animals and humans, papers, pulp plants, and tanneries are discharged into water bodies, and the organic materials decomposed by using large quantities of oxygen from water. Among the different wastes, human and animal feces are the most common cause of water contamination.

Diarrheal diseases, such as *E. coli* infection, giardiasis, and typhoid fever are the very common diseases that happen due to using unsafe water [28]. Different groups of individuals with low immunity are more susceptible to waterborne diarrheal diseases [26]. For example, children and infants due to the improperly developed immune system are more vulnerable to pathogen related to water borne diseases, and other toxic contaminants. It is well known that diarrheal disease is one of the leading causes of illness and death in young children in developing countries, especially Bangladesh and most countries of South Asia [29]. Individuals that are more susceptible to diarrheal diseases include cancer patients, HIV/AIDS patients, and transplant patients [28] (Figure 1).

Drinking water can carry a diverse range of pathogens that may be bacteria, viruses, and parasites. Surface and ground water is usually layered by bacteria and viruses; however, parasites/protozoa appear mostly in surface water.

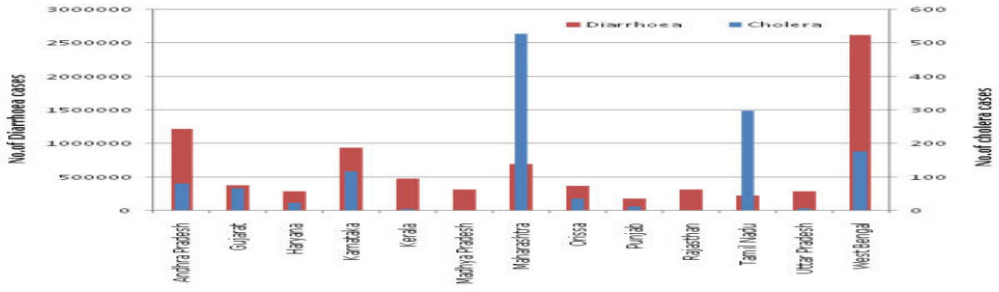

Figure 2: State-wise cases due to cholera in India 2007 and acute diarrhoeal disease in 2006. Source: Ministry of Health and Family Welfare, India.

ISSN: 2278-4632
Vol-10 Issue-6 No. 13 June 2020

Figure 2**:** State-wise cases due to cholera in India 2007 and acute diarrhoeal disease in 2006. Source: Ministry of Health and Family Welfare, India.

Treating Drinking Water

Water sources that include household pipesystem, public standpipe, borehole condition, protected dug well, protected spring and rainwater collection should be safe and accessible. The accessibility to safe water should be collateral with improved sanitation facilities such as connection to public sewer, connection to the septic system, or a pit latrine or water seal.

It is pertinent that water intended for drink require a system of treatment before use, even water from deep wells or springs. The treatment procedure mainly depends on the source of the water. The type and amount of water treatment can vary depending on the type of bacteria/viruses present. In difficult situations that compromise conventional treatment systems, waterborne pathogens may be killed or inactivated by boiling [59], but this requires a facility to store boiled water in sterile conditions.

Other techniques like filtration, chemical disinfection, and exposure to ultraviolet radiation have been validated in an array of randomized control trials to appreciably reduce levels of water-borne diseases among users in low-income countries [60], but these also may have some problems, such as absence of required facilities. The most commonly used forms of disinfection technologies include use of ultraviolet light, chlorine, chloramines, and ozone. Since viruses are so small, conventional treatment, including filtration, is ineffective at physically removing viruses. UV technology has been proved to be beneficial and gaining popularity for water treatment. Ozone is also an effective water treatment commonly used to reduce color, taste, and odor.

The routine treatment of water for bacteria/viruses is using chlorine, but this is not common for protozoa, mostly when applied to low turbidity water. Chloramine, a reaction product of chlorine and ammonia, which is less potent than chlorine may be used sometimes to successfully reduce *Legionella* counts. The efficacy of disinfectants is calculated by concentration (C) in mg/l, as well as time (T) in minutes (CT value,) necessary to attain the desired logs of disinfection under the temperature, and pH conditions. Bacteriophages act as good indicator organism, and their use as virus indicators to monitor human enteric viruses in waters, is applied [43]. Desalination is another type of water treatment that is used mainly in dry areas with access to large bodies of saltwater. However, monitoring for all pathogens still remains impractical [43]. Regardless of the disinfectant applied at a drinking water utility, cross-contamination can occur throughout the water distribution system due to cavitations; therefore, the use of secondary disinfectants in distribution systems is required [44].

Prevention

Any water origin disease outbreak should immediately be notified to healthcare officers. Detection should be done through routine reporting conditions, bacterial isolate sub-typing, and molecular analysis in the laboratory, consumer complaints, and systematic surveillance systems. The procedure might include calling potentially exposed groups, sending alerts, requesting specimens from laboratories, or issuing a media alert. Any type of water based illnesses associated with harmful toxicants, such as algal blooms should also be noted. It

ISSN: 2278-4632
Vol-10 Issue-6 No. 13 June 2020

is important to mention that epidemiological investigation should be done to identify causes, and to apply preventive measures. Samples should be transported to public health laboratories to confirm an etiologic agent, if necessary [61] and to implement public health measures to prevent further spread. Other simple measures can be taken to prevent contracting the disease, such as wearing gloves and shoes when in contact with water, boiling water that is used to wash dishes and clothes, and discouraging children from swimming in bodies of water [62,63].

Conclusion

Ensuring water quality and safety requires active participation of all stake holders with the medical community. However, the majority of health care professionals have received limited training in the evaluation of waterborne diseases. Lack of safe water to meet daily needs is a reality for many people around the world, and has serious health consequences. The situation is getting worse due to population growth, urbanization, and increased domestic and industrial water use. To overcome the water scarcity and other health issues, research is required in three main areas: increasing efficiency of domestic water use, developing technology for implementing and monitoring safe water reuse, and economic policies to promote effective water conservation. Practicing recycle and reuses strategies for wastewater and solid wastes should be the first option. The main challenge in detection of any waterborne disease outbreak is significant number of people may not consult a doctor so that it goes unnoticed. Globally, there were many waterborne disease outbreaks with several hundred or a thousand people affected, which are discovered more or less accidentally. Moreover, even with a good surveillance system waterborne outbreak detection is difficult. Therefore, Waterborne Disease and Outbreak Surveillance System (WBDOSS) should be established in each country mainly in developing countries. This system collects data on waterborne diseases, and outbreaks associated with recreational water, drinking water, environmental, and undetermined water exposures. Besides, there is a need to develop improved ways for better water treatment, and hygienic handling and management of water.

Discussion:

The quality of drinking water and possible associated health risks vary throughout the world. Whilst some regions show high levels of arsenic, fluoride or contamination of drinking water by pathogens, for example, elsewhere these are very low and present no problem for human health. Marked variations in levels of contamination also occur more locally, often as a result of agricultural and industrial activities. The differences in health risks that these variations represent lead to different priorities for the treatment and provision of drinking water. Microbial contamination of drinking water remains a significant threat and constant vigilance is essential, even in the most developed countries. More recent research has suggested a possible association between disinfection by-products and cancer and adverse reproductive outcomes, but potential risks are largely outweighed by the benefits of drinking water with a low microbial load. Where possible, however, further efforts should be made to reduce levels of disinfection by-products without compromising the disinfection process and at a reasonable cost to the consumer. To be

ISSN: 2278-4632
Vol-10 Issue-6 No. 13 June 2020

able to set priorities, good quality data on the levels of contaminants in water and related morbidity and mortality are needed, although the interpretation may be complicated by the multi-factorial nature of many diseases. Well-designed epidemiological studies are also needed for some of the contaminants such as chlorination by-products, arsenic, fluoride and uranium where information on exposure–response relationships is missing or of insufficient quality. In other cases, toxicological studies are also required to help to determine the potential risk.

There is evidence from a number of countries of consumers rejecting microbially safe public supplies, because of problems with discolouration and chlorine tastes, in favour of more expensive and microbiologically less satisfactory local supplies or bottled water. There is little point in making a considerable investment in providing safe public supplies if the water is not accepted by consumers. In particular, this can lead to poorer consumers, who are more likely to receive unacceptable water supplies, paying more for their water than better off consumers. Delivering safe and acceptable water, therefore, is a key target in improving public health in many developing countries. Even in developed countries, however, the same priority remains, as shown by waterborne outbreaks such as that at Walkerton in Canada that resulted in several deaths.There also remains a need for high quality research in a number of areas, though this must be set in the appropriate context for the countries in which the problems occur. Increased knowledge has shown the complexity of many of the issues that are related to drinking water and health. Overall, however, it is evident that the supply and maintenance of safe drinking water remain key requirements for public health.

Acknowledgement:
The author is very grateful to Prof. Dr. Anubha Pandya, HoD- department of Chemistry, Cristian Eminent College, Indore for going through the manuscript and giving her suggestions.

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