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Polluted Water Borne Diseases: Symptoms, Causes, Treatment and Prevention

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ABSTRACT

Polluted and dirty water is very harmful for living organisms especially for health of humans. It causes many serious health problems which can ultimately lead to death if not treated at early stages. Water borne diseases including cholera, Dracunculiasis, Typhoid fever, Diarrhea, Ulcers, Hepatitis, Arsenicosis, Respiratory Tract Infection, Kidney Damage, and Endocrine Damages are very risky for lives of individuals and especially for humans ultimately leading to death. These diseases are mainly due to drinking water problems because of presence of different harmful bacteria and germs which may cause these drugs. These diseases can be cured with proper medications and treatment courses. Along the treatment, there are different ways to prevent from these diseases. So, the lives of human beings can be protected from these water borne-disease. The water treatment can also be used so no one can drink or use dirty or untreated water and can be saved from these effects. So, in this article, causes of these diseases, factors increasing the risks, treatment and prevention ways are summarized briefly.

1. Introduction

According to some estimates, every year a few million Americans and billions of citizens of other countries are made ill by polluted water. Water pollution involves the pollution of surface waters and/or groundwater, which may cause a series of diseases referred to as water pollution diseases. These could have serious health impacts.[1] While we can control (to some extent) the water we drink, the pollution of our water streams may have long-term effects by reducing the "drinkable" water reserves of our planet. Additionally, the common filtration methods for water are not efficient for some of the new emerging contaminantswhich are often not even tested for contaminants. Water pollution travels slower than air pollution but still may affect large areas.[2]

Water may commonly be polluted by two main categories of pollutants:

Chemicals: Including natural or man-made (xenobiotic) chemicals that gets into a water body (by being dissolved or dispersed in the water) and reaching concentrations that raise serious health concerns; note that, similar to the case of air pollutants, the presence of such pollutants in water is not always obvious and may not be detected by our senses. Common problematic chemicals getting into water are pesticides, chlorinated solvents, petroleum chemicals, mercury, PCBs, dioxins and other persisting organic pollutantsas;[3] well as any of the other tens of thousands of chemicals used in industrial processes.

Living organisms (as long as they are induced by human activity; please note that some waters unaffected by human activity may still be naturally polluted with some of these organisms in which case, the caused diseases may not be seen as pollution diseases:[4]

Pathogens: Including a variety of living organisms (usually from animal waste) such as various species of viruses, bacteria, fungi and intestinal worms. Their presence in water, many times, remains unnoticed.

Algae: Some types of algae are toxic and may overgrow due to the presence of nitrates and phosphates in runoff water (especially agricultural runoff); such overgrowth is usually referred to as "red tides" or "brown tides". Their toxins may affect the food chain, including fish and birds, and ultimately humans. Oxygen depletion in polluted water is another serious problem responsible for killing fish all over the world.While the most common water pollution diseases involve poisoning episodes affecting the digestive system and/or causing human infectious diseases, water pollution may cause a large variety of health diseases including infectious diseases caused by pathogens (usually microorganisms) from animal fecal origins, of which the most common occur in developing countries, including Typhoid, Giardiasis, Amoebiasis, Ascariasis, and Hookworm. Diseases caused by polluted beach water, includingGastroenteritis, Diarrhea, Encephalitis, Stomach cramps and aches, Vomiting, Hepatitis and Respiratory infections. Liver damage and even cancer which is due to DNA damage, are caused by a series of chemicals such as chlorinated solvents.

Kidney damage caused by a series of chemicals. Neurological problems damage to the nervous system usually due to the presence of chemicals such as pesticides.Reproductive and endocrine damage including interrupted sexual development, inability to breed, degraded immune function, decreased fertility and increase in some types of cancers caused by a series of chemicals including endocrine disruptors. Thyroid system disorders (a common cause is exposure to perchlorate, which is a chemical contaminating large water bodies such as the Colorado River). Increased water pollution creates breeding grounds for malaria-carrying mosquitoes, which kill 1.2-2.7 million people a year. A series of less serious health effects could be associated to bathing in contaminated water (i.e. polluted beach water) includingRashes, Earaches and Pink eyes.[2]

Water pollution can affect us directlythrough consumption or bathing in a polluted stream such as consumption of

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municipal water, as well as bathing in polluted lakes or beach water and indirectlythrough the consumption of vegetables irrigated with contaminated water, as well as of fish or other animals that live in the polluted water or consume animals grown in the polluted water.[5] This is many times more dangerous than being directly affected through consumption of water, because some pollutants bioaccumulate in fish and living organisms their concentration in fish could be several orders of magnitude higher than their water concentration. Additionally, the toxins from the brown tide are strong and can travel via air, affecting homeowners close to the beach.[6] Infectious diseases can be spread through contaminated water. Some of these water-borne diseases are Typhoid, Cholera, Paratyphoid Fever, Dysentery, Jaundice, Amoebiasis and Malaria.[7] Chemicals in the water also have negative effects on our health. Pesticidescan damage the nervous system and cause cancer because of the carbonates and organophosphates that they contain. Chlorides can cause reproductive and endocrinal damage.Nitrates are especially dangerous to babies that drink formula milk. It restricts the amount of oxygen in the brain and cause the "blue baby" syndrome.Leadcan accumulate in the body and damage the central nervous system. Arseniccauses liver damage, skin cancer and vascular diseases.[8] Flouridesin excessive amounts can make your teeth yellow and cause damage to the spinal cord.Petrochemicalseven with very low exposure, can cause cancer.[9]

Diseases Caused by Polluted Water

Water borne diseases including cholera, Dracunculiasis, Typhoid fever, Diarrhea, Ulcers, Hepatitis, Arsenicosis, Respiratory tract infection, Kidney Damage, and Endocrine Damage are very risky for lives of individuals and especially for humans, these can lead ultimately death.[10] These diseases are mainly due to drinking water problems because of presence of different harmful bacteria and germs which may cause these drugs. These diseases can be cured with proper medications and treatment courses. Along the treatment, there are different ways to prevent from these diseases.

Cholera

Cholera disease is mainly caused due to water pollution. In polluted, dirty and hard water, different bacteria are contaminated (fig.1), which cause different diseases like cholera.[8] Its symptoms include the stomach ulcer, severe dehydration, rapid diarrhea and sometimes, it ends with death. Main causes of the cholera are the bacteria available in polluted water, hard water ingestion containing cholera causing germs. Swimming in dirty unsafe water can cause cholera. Deficiency in stomach acid can cause to increase the risks for cholera disease. Besides it, O-blood group (including +O, -O), raw shellfish, and bad sanitaration of sewage system also lead to cholera. To treat the cholera, a proper careful vaccination is needed to be done along with strict antibiotics and hospitalization. To prevent from cholera, either treated, boiled or bottled water should be used. Fruits and vegetables should be washed before use. Avoid to use the unpasteurized milk products and uncooked shellfish.

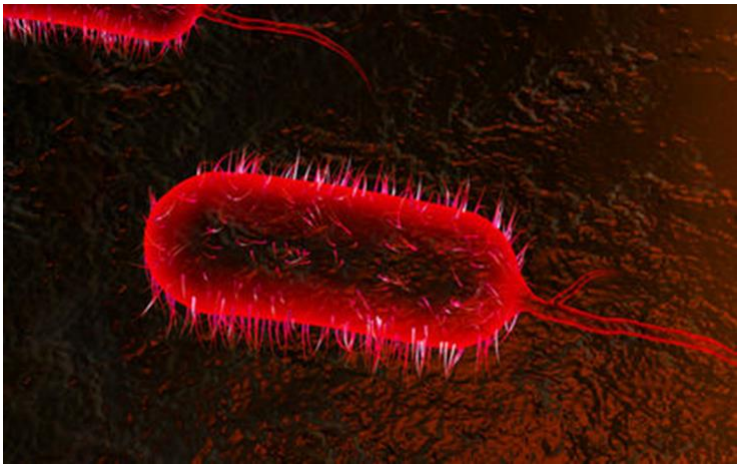

Fig. 1: Cholera Causing bacteria in dirty water

Dracunculiasis

Dracunculiasisis guinea-worm, crippling parasitic disease caused by Dracunculusmedinensis (**fig.2**). It is transmitted exclusively when people drink stagnant water contaminated with parasite-infected water fleas.[11] Dracunculiasis is rarely fatal, but infected people become non-functional for weeks. It affects people in rural, deprived and isolated communities who depend mainly on open surface water sources such as ponds for drinking water. Its commons symptoms include the high fever, pain, swelling, vomiting, diarrhea, itching in skin, stinging, tingling skin and worms are visible in welts on the skin. Ingestion of dirty water, swimming in polluted water and existence in that area where infection lead to increase the risks for Dracunculiasis. To treat the Dracunculiasis, proper topical antibiotics should be used carefully. Ibuprofen is a magic drug that can reduce the inflammation and pain from body. [11]

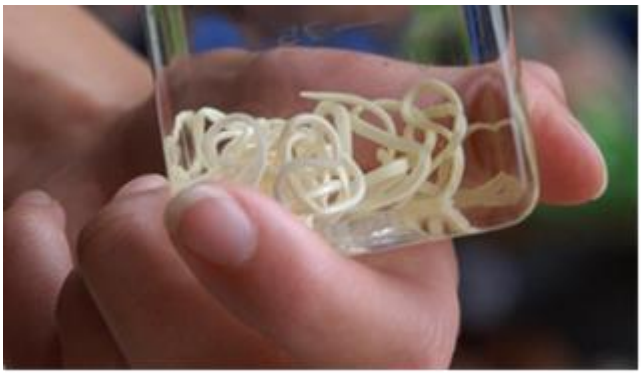

Fig. 2: Guinea-worm

Prevention is possible however and it is through preventive strategies that the disease is on the verge of eradication. Prevention strategies include: heightening surveillance to detect every case within 24 hours of worm emergence, preventing transmission from each worm by treatment, cleaning and bandaging regularly the affected skin-area until the worm is completely expelled from the body, preventing drinking water contamination by advising the patient to avoid wading into water, ensuring wider access to improved drinking-water supplies to prevent infection, filtering water from open water bodies before drinking, implementing vector control by using the larvicidetemephos, and promoting health education and behavior change.

Typhoid

Typhoid fever is a type of enteric fever along with paratyphoid fever.[12] The cause is the bacterium Salmonella Typhi, also known as Salmonella enterica serotype Typhi, growing in the intestines and blood. Typhoid is spread by eating or drinking food or water contaminated with the feces of an infected person.[1] Other symptoms for typhoid are headache, stomach pain, loss of appetite, weakness, weight loss, constipation, and sometimes, internal bleeding through vomiting. Bacteria that can be found in polluted water, cause the typhoid fever in humans. Food that has been contaminated by either drinking contaminated water or being grown with contaminated water also a cause of typhoid fever. Antibiotic treatment and hospitalization are the most common types of treatment for typhoid. Ibuprofen for inflammation and pain may also be administered.[9, 13] Following preventive measures can be applied to be saved from typhoid fever which are; Wash your hands frequently and don't touch your eyes with dirty hands, don't drink water from taps or make ice from this water in countries where typhoid is present, don't eat raw or room temperature food in these countries, don't eat unwashed food.

Diarrhea

Diarrhea is an increase in the frequency of bowel movements or a decrease in the form of stool (greater looseness of stool). Although changes in frequency of bowel movements and looseness of stools can vary independently of each other, changes often occur in both.[9] With diarrhea, stools usually are looser whether or not the frequency of bowel movements is increased. This looseness of stool--which can vary all the way from slightly soft to watery--is caused by increased water in the stool. During normal digestion, food is kept liquid by the secretion of large amounts of water by the stomach, upper small intestine, pancreas, and gallbladder. Food that is not digested reaches the lower small intestine and colon in liquid form. The lower small intestine and particularly the colon absorb the water, turning the undigested food into a more-or-less solid stool with form. Increased amounts of water in stool can occur if the stomach and/or small intestine secrete too much fluid,[10] the distal small intestine and colon do not absorb enough water, or the undigested, liquid food passes too quickly through the small intestine and colon for enough water to be removed.

The main cause for Diarrhea is drinking water which is polluted with bacteria and chemicals. Without filtration and treatment, use of drinking water and foods without wash may increase the risks for diarrhea. Treatment of diarrhea usually involve the rest and plenty of liquids.Hospitalization may be required for severe dehydration.Eating simple foods until the stomach settles is a priority with diarrhea. To prevent from diarrhea, always boil water or use bottled water if you aren't sure of the quality, use a filter at home if you have well water or questionable city water, and wash food with clean water.

Ulcers

Peptic ulcers are open sores that develop on the inside lining of your stomach and the upper portion of your small intestine. The most common symptom of a peptic ulcer is stomach pain.Peptic ulcers include:**Gastric ulcers** that occur on the inside of the stomach (**Fig.3**), **Duodenal ulcers** that occur on the inside of the upper portion of your small intestine (duodenum).[14] The most common causes of peptic ulcers are infection with the bacterium Helicobacter pylori (H. pylori) and long-term use of aspirin and certain other painkillers, such as ibuprofen (Advil, Motrin, others) and naproxen sodium (Aleve, Anaprox, others). Stress and spicy foods do not cause peptic ulcers. However, they can make your symptoms worse.

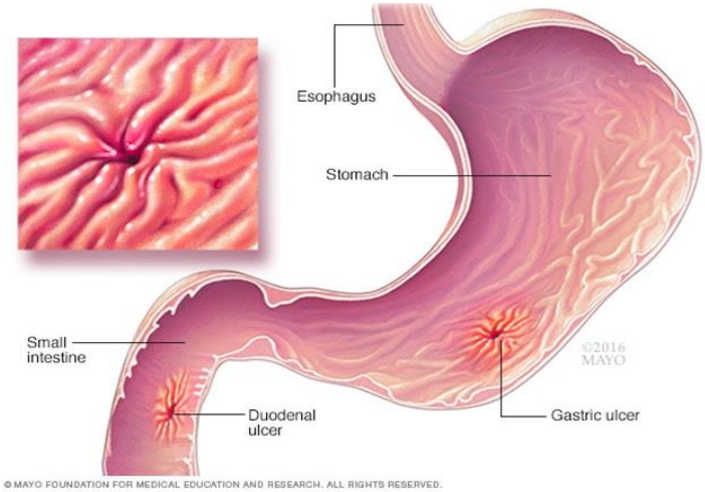

Fig. 3: Gastric Ulcer

Fullness in the stomach, even after eating very little, Frequent bloating and gas, burning pain described as being in the "pit" of the stomach and Frequent heartburn and nausea are the common symptoms of stomach ulcer. Any type of irritation to the lining of the stomach or intestines, Chemical pollutants in water, which can damage the lining of the stomach severely and Bacteria that may be present in water are the causes of ulcer.[5] Frequently drinking alcohol and smoking, eating spicy foods often, being high-stress much of the time, combining any of these factors with consuming polluted water are the factors that can increase the risks for ulcer. If caused by bacteria, antibiotics are used to cure the ulcer. Medication also can be used that reduces the production of acid in the stomach. Antacids on a regular basis can also be used to treat the ulcer. Medication that protects the stomach's lining are used to cure the ulcer. Taking aspirin, as well as certain over-the-counter and prescription pain medications called nonsteroidal anti-inflammatory drugs (NSAIDs) can irritate or inflame the lining of your stomach and small intestine. These medications include ibuprofen (Advil, Motrin IB, others) and naproxen sodium (Aleve, Anaprox, others), but not acetaminophen (Tylenol).Peptic ulcers are more common in older adults who take these pain medications frequently or in people who take these medications for osteoarthritis.Certain other medications along with NSAIDs, such as steroids, anticoagulants, low-dose aspirin, selective serotonin reuptake inhibitors (SSRIs), alendronate (Fosamax) and risedronate (Actonel), can greatly increase the chance of developing ulcers.[2,15] To prevent from Ulcer, avoid contaminated water to reduce the risk of irritating the stomach or introducing some bacteria.Do not use alcohol or tobacco regularly and eat mild foods.

Hepatitis

Hepatitis is inflammation of the liver tissue. Some people have no symptoms whereas others develop yellow discoloration of the skin and whites of the eyes, poor appetite, vomiting, tiredness, abdominal pain, or diarrhea. Hepatitis may be temporary (acute) or long term (chronic) depending on whether it lasts for less than or more than six months. Acute hepatitis can sometimes resolve on its own, progress to chronic hepatitis, or rarely result in acute liver failure. Over time the chronic form may progress to scarring of the liver, liver failure, or liver cancer. The most common cause worldwide is viruses.[15] Other causes include heavy alcohol use, certain medications, toxins, other infections, autoimmune diseases, and non-alcoholic steatohepatitis (NASH). There are five main types of viral hepatitis: type A, B, C, D, and E. Hepatitis A and E are mainly spread by contaminated food and water. The introduction of fecal matter into the body causes the hepatitis.A virus spread from fecal matter to the human liver also leads to hepatitis. Abuse of alcohol or tobacco significantly over time, other drug use and exposure to unsanitary conditions increase the risks for hepatitis. Rigid antibiotic treatment over time, and antiviral medication administered for a long period of time are necessary for treatment of hepatitis. Vaccination against hepatitis from a young age should be done to prevent from this disease. Avoiding unsanitary conditions, boiling or filtering water before use and avoiding swimming in natural, untreated bodies of fresh water may also prevent from this disease.

Arsenicosis

Arsenicosis is a chronic illness resulting from drinking water with high levels of arsenic over a long period of time (such as from 5 to 20 years). It is also known as arsenic poisoning.[16] The WHO recommends a limit of 0.01 mg/l of arsenic in drinking water.
It results in various health effects including skin problems, skin cancer, cancers of the bladder, kidney and lung, and diseases of the blood vessels of the legs and feet, and possibly also diabetes, high blood pressure and reproductive disorders.

Fig. 4: Symptom of Arsenicosis

The symptoms of arsenic poisoning can be acute, or severe and immediate, or chronic, where damage to health is experienced over a longer period. This will often depend on the method of exposure.A person who has swallowed arsenic may show signs and symptoms within 30 minutes.These may include the drowsiness, headaches, confusion and severe diarrhea. If arsenic has been inhaled, or a less concentrated amount has been ingested, symptoms may take longer to develop. As the arsenic poisoning progresses, the patient may start experiencing convulsions, and their fingernail pigmentation may change.Signs and symptoms associated with more severe cases of arsenic poisoning are; a metallic taste in the mouth and garlicky breath, excess saliva, problems swallowing, blood in the urine, cramping muscles, hair loss, stomach cramps, convulsions, excessive sweating, vomiting and diarrhea. Arsenic poisoning typically affects the skin, liver, lungs, and kidneys. In the final stage, symptoms include seizures and shock. This could lead to a coma or death.

Complications linked to long-term arsenic consumption include:cancer, liver disease, diabetes, nervous system complications, such as loss of sensation in the limbs and hearing problems and digestive difficulties.[17]

Groundwater possesses trace amounts of arsenic. On occasion, these levels may exceed the amount a human can safely ingest.The main cause of arsenic poisoning is the consumption of a toxic amount of arsenic.Arsenic, consumed in large amounts, can kill a person rapidly. Consumed in smaller amounts over a long period, it can cause serious illness or a prolonged death.The main cause of arsenic poisoning worldwide is the drinking of groundwater that contains high levels of the toxin. The water becomes contaminated underground by rocks that release the arsenic.

The treatment depends on the type and stage of the arsenic poisoning. Some methods remove arsenic from the human body before it causes any damage. Others repair or minimize the damage that has already occurred. Treatment methods include: removing clothes that could be contaminated with arsenic, thoroughly washing and rinsing affected skin, blood transfusions[18], taking heart medication in cases where the heart starts failing, using mineral supplements that lower the risk of potentially fatal heart rhythm problems and observing kidney function.

Bowel irrigation is another option. A special solution is passed through the gastrointestinal tract, flushing out the contents. The irrigation removes traces of arsenic and prevents it from being absorbed into the gut.

Respiratory Tract Infection

Respiratory tract infection (RTI) refers to any of a number of infectious diseases involving the respiratory tract (Fig.5). An infection of this type is normally further classified as an upper respiratory tract infection (URI or URTI) or a lower respiratory tract infection (LRI or LRTI)[6]. Lower respiratory infections, such as pneumonia, tend to be far more serious conditions than upper respiratory infections, such as the common cold.

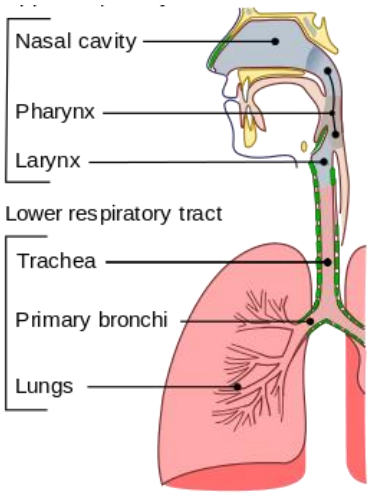

Fig. 5: Respiratory Tract

Symptoms includes the coughing or sneezing, Stuffy head, Headache and earache, rattling in the chest and difficulty

breathingBacteria that may be ingested through contaminated water, exposure to viruses in water that has been polluted with fecal matter and exposure to chemicals in polluted water lead to cause this disease.[15] A weak immune system due to disease or medication, frequent respiratory infections in the past and living in unsanitary conditions are the factors which may increase the risks for this disease.

Antibiotic or antiviral medication should be used to treat the Respiratory Infection.[19] Plenty of rest and liquids, hospitalization in some situations, and medication to break up mucus in some situations may also lead to reduce this disease.

Kidney Damage

Reduced urine levels, shortness of breath, fatigue, confusion, pain in the sides and convulsions are symptoms of kidney damage. Kidney damage infection[17] caused by drinking water polluted with bacteria and allergic reactions to chemicals in water may also lead to kidney damage.[16] Weakened immune system, previous kidney infection, and certain medications without recommendations of a specialist may cause to increase the risks for kidney damage.[20] For infection, treatment with aggressive antibiotics or antiviral medication may work.Painkillers to reduce pain and inflammation also used.Dialysis may be required when kidney function is limited.A kidney transplant may also be required in extreme situations. To prevent, do not drink water from groundwater that may have been contaminated with chemical runoff, and from natural sources without filtration.

Endocrine Damage

Diabetes, excessive hunger, excessive thirst, weight loss or gain, frequent need to urinate, swollen feet or hands and Joint aches are symptoms of endocrine damage.[20] Lesions caused by exposure to certain chemicals, hormone imbalance caused by chemical exposure, and Infection from bacteria may cause the endocrine damage. Existing diabetes, exposure to chemicals and hormones in polluted water and too much or too little iodine may lead to increase the risks for endocrine damage.

Depending on the type of endocrine disorder, treatment may vary significantly. Medication is available to treat many endocrine disorders. Hormone replacement may work in some cases. To prevent from endocrine damage, eating healthy food and a balanced diet, and frequent blood tests to check for possible problems.

Conclusion

Water borne diseases including cholera, Dracunculiasis, Typhoid fever, Diarrhea, Ulcers, Hepatitis, Arsenicosis, Respiratory Tract Infection, Kidney Damage, and Endocrine Damages are very risky for lives of individuals and especially for humans, these can lead ultimately death. These diseases are mainly due to drinking water problems because of presence of different harmful bacteria and germs which may cause these drugs. These viral mircoorganisms not only affect human lives but also causes problems in their community. These diseases can be cured with proper medications and treatment courses. Along the treatment, there are different ways to prevent from these diseases. These diseases must be cured at early stages and must adopt the ways to prevent from them. So, that the lives of human beings can be protected from these water borne-disease. The water treatment can also be used so no one can drink or use dirty or untreated water and can be saved from these effects.

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This article summarizes the causes of polluted water borne diseases, factors increasing the risks, treatment and prevention briefly. Author has no conflict of interest to disclose in future for this article.

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