

## **Waterborne diseases :**

**Waterborne diseases** are conditions caused by pathogenic micro-organisms that are transmitted in water. Disease can be spread while bathing, washing or drinking water, or by eating food exposed to contaminated water. While diarrhea and vomiting are the most commonly reported symptoms of waterborne illness, other symptoms can include skin, ear, respiratory, or eye problems.

Various forms of waterborne diarrheal disease are the most prominent examples, and affect children in developing countries most dramatically. According to the World Health Organization, waterborne diseases account for an estimated 3.6% of the total DALY (disability- adjusted life year) , and cause about 1.5 million human deaths annually.

The term waterborne disease is reserved largely for infections that predominantly are transmitted through contact with or consumption of infected water. Microorganisms causing diseases that characteristically are waterborne prominently include protozoa and bacteria, many of which are intestinal parasites, or invade the tissues or circulatory system through walls of the digestive tract. Various other waterborne diseases are caused by viruses. . Outbreaks of waterborne diseases often occur after a severe precipitation event (rainfall, snowfall)

.Water-related illnesses fall into four major categories:

- **Water borne diseases**, including cholera, typhoid, and dysentery, are caused by drinking water containing infectious viruses or bacteria, which often come from human or animal waste.
- **Water-washed diseases**, such as skin and eye infections, are caused by lack of clean water for washing.
- **Water-based diseases**, such as schistosomiasis, are spread by organisms that develop in water and then become human parasites. They are spread by contaminated water and by eating insufficiently cooked fish.
- **Water-related insect vectors**, such as mosquitoes, breed in or near water and spread diseases, including dengue and malaria. This category is not directly related to water supply or quality.

more than 1 billion people worldwide lack safe drinking water,. Conventional large-scale engineering projects that pipe water from central distribution systems can provide safe

water with highly cost, and can reduce this cost in Small-scale approaches, such as drilling wells water and chlorination.

## Infections by type of pathogen

### Protozoa

Disease and Transmission	Microbial Agent	General Symptoms
<u>Acanthamoeba keratitis</u> (cleaning of contact lenses with contaminated water)	<u>Acanthamoeba spp.</u> ( <i>A. castellanii</i> and <i>A. polyphaga</i> )	Eye pain, eye redness, blurred vision, sensitivity to light, sensation of something in the eye, and excessive tearing
<u>Amoebiasis</u> (hand-to-mouth)	Protozoan ( <u>Entamoeba histolytica</u> ) (Cyst-like appearance)	Abdominal discomfort, <u>fatigue</u> , weight loss, <u>diarrhea</u> , <u>bloating</u> , <u>fever</u>
<u>Cryptosporidiosis</u> (oral)	Protozoan ( <u>Cryptosporidium parvum</u> )	<u>Flu-like symptoms</u> , watery diarrhea, loss of appetite, substantial loss of weight, <u>bloating</u> , increased gas, <u>nausea</u>
<u>Giardiasis</u> (fecal-oral) (hand-to-mouth)	Protozoan ( <u>Giardia lamblia</u> ) Most common intestinal parasite	Diarrhea, abdominal discomfort, <u>bloating</u> , and <u>flatulence</u>

### Bacteria

Disease and Transmission	Microbial Agent	General Symptoms
<u>Botulism</u>	<u>Clostridium botulinum</u>	Dry mouth, <u>blurred</u> and/or <u>double vision</u> , difficulty swallowing, muscle weakness, difficulty breathing, slurred speech, <u>vomiting</u> and <u>diarrhea</u> .
<u>Campylobacteriosis</u>	Most commonly caused by <u>Campylobacter jejuni</u>	Produces <u>dysentery</u> -like symptoms along with a <u>high fever</u> . Usually lasts

		2–10 days.
<u>Cholera</u>	Spread by the bacterium <u>Vibrio cholerae</u>	In severe forms it is known to be one of the most rapidly fatal illnesses known. Symptoms include very watery diarrhea, <u>nausea</u> , <u>cramps</u> , <u>nosebleed</u> , rapid <u>pulse</u> , vomiting, and <u>hypovolemic shock</u> (in severe cases), at which point death can occur in 12–18 hours.
<u>E. coli Infection</u>	Certain strains of <u>Escherichia coli</u> (commonly <u>E. coli</u> )	Mostly diarrhea. Can cause death in <u>immunocompromised individuals</u> , the very young, and the elderly due to <u>dehydration</u> from prolonged illness.
<u>Dysentery</u>	Caused by a number of species in the genera <u>Shigella</u> and <u>Salmonella</u> with the most common being <u>Shigella dysenteriae</u>	Frequent passage of <u>feces</u> with <u>blood</u> and/or <u>mucus</u> and in some cases vomiting of blood.
<u>Legionellosis</u>	Caused by bacteria belonging to genus <u>Legionella</u> (90% of cases caused by <u>Legionella pneumophila</u> )	Pontiac fever produces milder symptoms resembling acute <u>influenza</u> without <u>pneumonia</u> . Legionnaires' disease has severe symptoms such as <u>fever</u> , <u>chills</u> , pneumonia (with cough that sometimes produces <u>sputum</u> ), <u>ataxia</u> , <u>anorexia</u> , muscle aches, <u>malaise</u> and occasionally diarrhea and vomiting
<u>Salmonellosis</u>	Caused by many bacteria of genus <u>Salmonella</u>	Symptoms include <u>diarrhea</u> , <u>fever</u> , vomiting, and abdominal cramps
<u>Typhoid fever</u>	<u>Salmonella typhi</u>	Characterized by sustained fever up to 40 °C (104 °F), profuse <u>sweating</u> ; diarrhea may occur. Symptoms progress to <u>delirium</u> , and the <u>spleen</u> and <u>liver</u> enlarge if untreated. In this case it can last up to four weeks and cause death. Some

		people with typhoid fever develop a rash called "rose spots", small red spots on the abdomen and chest.
<u>Vibrio Illness</u>	<u>Vibrio vulnificus</u> , <u>Vibrio alginolyticus</u> , and <u>Vibrio parahaemolyticus</u>	Symptoms include abdominal tenderness, agitation, bloody stools, chills, confusion, difficulty paying attention (attention deficit), delirium, fluctuating mood, hallucination, nosebleeds, severe fatigue, slow, sluggish, lethargic feeling, weakness.

## Viruses

Disease and Transmission	Viral Agent	General Symptoms
<u>SARS</u> (Severe Acute Respiratory Syndrome)	<u>Coronavirus</u>	Symptoms include <u>fever</u> , <u>myalgia</u> , <u>lethargy</u> , <u>gastrointestinal symptoms</u> , <u>cough</u> , and sore throat
<u>Hepatitis A</u>	Hepatitis A virus (HAV)	Symptoms are only <u>acute</u> (no <u>chronic</u> stage to the virus) and include <u>Fatigue</u> , fever, abdominal pain, nausea, diarrhea, weight loss, itching, <u>jaundice</u> and <u>depression</u> .
Hepatitis E ( <u>fecal-oral</u> )	<u>Hepatitis E virus</u> (HEV)	Symptoms of acute <u>hepatitis</u> (liver disease), including <u>fever</u> , <u>fatigue</u> , loss of appetite, <u>nausea</u> , vomiting, abdominal pain, <u>jaundice</u> , dark urine, clay-colored stool, and joint pain
Acute gastrointestinal illness [AGI] ( <u>fecal-oral</u> ; spread by food, water, person-to-person, and fomites)	<u>Norovirus</u>	<u>Diarrhea</u> , vomiting, <u>nausea</u> , stomach pain
<u>Poliomyelitis</u> (Polio)	<u>Poliovirus</u>	90-95% of patients show no symptoms, 4-8% have minor symptoms (comparatively)

		with <u>delirium</u> , <u>headache</u> , <u>fever</u> , and occasional <u>seizures</u> , and <u>spastic paralysis</u> , 1% have symptoms of non-paralytic <u>aseptic meningitis</u> . The rest have serious symptoms resulting in <u>paralysis</u> or death
<u>Polyomavirus infection</u>	Two of <u>Polyomavirus</u> : <u>JC virus</u> and <u>BK virus</u>	BK virus produces a mild <u>respiratory infection</u> and can infect the <u>kidneys</u> of <u>immunosuppressed transplant</u> patients. JC virus infects the <u>respiratory system</u> , kidneys or can cause <u>progressive multifocal leukoencephalopathy</u> in the <u>brain</u> (which is fatal).

**Preventing Water-Borne Diseases** Clean water is a prerequisite for reducing the spread of water-borne diseases. It is well recognized that the prevalence of water-borne diseases may be greatly reduced by providing people with safe, sanitary disposal of feces and provision of clean drinking water. Water is disinfected to kill any pathogens that might be present in the water supply and to prevent them from growing again in distribution systems. Disinfection is then used in order to prevent the growth of pathogenic organisms and to protect people's health. People need clean water and water supply systems. Without disinfection, the risk of water-borne disease increases. The 2 most common methods of killing microorganisms in the water supply are irradiation with ultra-violet radiation, or oxidation with chemicals like chlorine dioxide or ozone, or chlorine.

A significant amount of disease could be prevented especially, through better access to safe water supply, adequate sanitation facilities and better hygiene practices. In order to allow informed decision-making on interventions aimed at disease prevention and control Nearly 4% of the global disease burden could be prevented by improving water supply, sanitation, and hygiene.