



# QUALITY OF POTABLE WATER AND WATER BORNE DISEASE-A REVIEW

Jagriti Sharma<sup>1,\*</sup> and Sangita Srivastava<sup>1,2</sup>

<sup>1</sup>Department of Home science, University of Allahabad, Prayagraj (UP), India

<sup>2</sup>Professor Rajendra Singh (Rajju Bhaiya) University, Prayagraj, (UP), India

## Abstract

Water is the elixir of life it is directly linked to social and economic development and quality of human life. Clean water and sanitation is one of the aims of Sustainable Development goal. Water is essential for all living organism and survival on earth is not possible without water. Available drinking water is contaminated and these contaminants influence the quality of water's physical, chemical and microbiological quality such as pH, TDS, BOD, COD, turbidity, colour, hardness, fluoride, lead, mercury, nitrate, and presence of microbes like e.coli, shigella, clostridium, salmonella etc. Due to poor quality of potable water human population is suffering from various health issues and water borne diseases (like typhoid fever, hepatitis, cholera, dysentery, diarrhoea, malaria etc). Presence of heavy metals in drinking water also causes poisoning, serious damage may occur such as neuropathy, encephalopathy, renal problem etc. nitrate can cause blue baby syndromes and hardness of drinking water are related to risk for cardiovascular disease, growth retardation, reproductive failure, formation of stone and other and health issues. Reason of water impurities due to natural activities soil erosion, weathering of rocks, volcanic eruption, flood etc and manmade activities such as increased human population, industrialization, use of fertilizers and pesticide water is highly polluted with various harmful contaminants.

**Key words:** water, water-quality, water borne disease, bacteria.

## Introduction

Water is abiotic component which is essential for all biotic components (living organism) and it is required for survival on a daily basis, without water life is not possible on earth (Jequier and constant, 2010). Where 70% of earth is covered by water only 3% fresh water is available and remaining 97 percent is salt water. Quality of water is directly linked with human health, social and economic development and welfare of a country. As per the report of WHO more than 3.4 million people die each year from water borne diseases. Physical, chemical, and microbial contaminates decrease the quality of fresh water. Industrialization, urbanization and increased population, use of fertilizer and pesticides by farmers, mining areas and number of other manmade activities; all these factors contaminate the quality of water. Industrialization is also a major cause which erodes the quality of water through its toxic effluents and these are responsible for deteriorating the quality of water in rivers and other reason which affects the quality of water is domestic sewage system in urban areas. These factors are the major cause of water pollution and contaminated river water (Shivaraja, 2012). Contaminated water supply affects the life of common people. Potable water is major problem of present day because water is contaminated by various undesirable particles which affect the human health and are the cause of water borne diseases. Water borne diseases are caused by contamination of bacteria through water or food, due to infection of bacteria such as *Salmonella typhi*, *Vibrio cholera*, *Bacillary dysentery*,

*Escherichia coli* etc (Park, 2015). water borne diseases include typhoid, cholera, dysentery, diarrhoea etc are the major cause of health issues. These Bacteria are identified on the basis of morphological structure, staining properties, oxygen requirement of the species and biochemical test. On the basis of staining properties bacteria is classified in two categories *gram positive and gram negative bacteria*; the difference between two group is due to thick peptidoglycan layer in gram positive bacteria stains blue purple and gram negative bacteria have thin peptidoglycan layer it stains red. Gram negative have an additional cytoplasmic membrane which secretes endotoxin which is harmful for health and causes water borne diseases (Singh, 2012).

## Water Quality

Physical, chemical and microbiological properties of water represent the term "water quality". The quality of water is affected by presence of organic and inorganic matter dissolved in water. WHO Water quality index are appropriate in assessing global water quality and functional tool for promoting health, reducing poverty and human development See the Table-1 for WHO water quality index.

## Water Borne Disease

Water borne diseases are spread through microbial contamination of water or food and are caused by bacteria (causes disease like cholera, acute gastroenteritis, diarrhoea, dysentery, typhoid). WHO in 2015 reveals that 502000 diarrheal deaths happen each year. Children under five years

\*Corresponding author Email: jagritisharma51@gmail.com

are more vulnerable to get infected due to low immunological status. The main cause of water borne disease are poor hygiene and sanitation, untreated or infected water supplies, uncovered, drinking water utensils, unclean hands etc. Water borne disease spread after natural disaster such as flood, tsunami, earthquakes etc (Park, 2015). People in these areas suffer from water borne diseases due to overcrowded shelters and camps, poor sanitation and poor hygiene practices and contaminated food and water (WHO). These reasons affect the daily life and health of people and the major cause of water borne diseases.

**Typhoid:** Typhoid is fever caused by salmonella typhi this bacteria is multi-organ pathogen responsible for two types of infection which occur in human body first is food poisoning which occurs due to low virulence serotype and second is typhoid which is caused by high virulence serotype salmonella enteric (*S. typhi*) (Andino and Hanning, 2015). *Salmonella typhi* is gram negative bacteria enteric bacillus belongs to the family Enterobacteriaceae. The incubation period is depending on the immunological status of the person. The main cause of typhoid fever is drinking water which is contaminated through urine and faeces of infected individuals (Park, 2015). *S. typhi* is mainly infected through faecal-oral route. Symptoms of typhoid headache, chills, cough, myalgia, high fever, diarrhoea and loss of appetite mostly patients suffer from abdominal complication (Vogholkar and Mirani, 2015). Salmonella typhi enter to the human body by ingestion and it multiplies in the intestinal wall between the period of 1-3 week. This organism contain endotoxin and also excretes a protein known as invasions these proteins that damage host cell and spread other organ and tissue of infected person inhibit the lymphatic tissue of the small intestine, liver, spleen and blood stream of infected human. Salmonella typhi is also able to inhibit burst of leukocytes which affects the innate immune response (Andino and Hanning, 2015).

**Cholera:** Cholera is an acute diarrheal disease caused by infection of *V. cholerae* 01 and 0139 through ingestion of contaminated food and water with the vibrio cholera bacteria (Park, 2015). Infected person suffer from persistent vomiting due to this loss of electrolyte, dehydration and muscular cramps. Cholera is many time the cause of death because they have ability to spread infection rapidly (WHO, 2015). *V. cholera* is gram negative bacteria produces an exotoxin which causes diarrhea when they multiply in the in the intestine of the wall of lumen.

**Diarrhoea:** Diarrhoea exhibits the symptoms of discharge of thin and watery stool at persistent interval more than three times a day number of stool is more important consistency and character of stool (WHO, 2015). Bacteria are responsible for diarrhoea *Eschericia coli*, *Shigella*, *Vibrio cholera*, *Sallmonella* etc. Mode of transmission of diarrhoea is fecal-oral route (Park, 2015).

**Dysentery:** Dysentery is an intestinal infection which causes bloody diarrhea that is presence of red blood cells in stool. *Shigella bacillus* is gram negative rod shape bacteria (Sing, 2012). Dysentery is cause by shigella bacillus and infected person suffers from stomach cramp and dehydration (Park, 2015). Infection of dysentery spread

through fecal matter of infected person.

## Cycle of water borne disease

Figure 1 shows how water borne disease transmits from one person to other person. Water is contaminated through unclean hand, mosquito, infected water and soil by faecal matter of infected person.

## Discussion

The concentration of physical, chemical and microbial parameter are increase regularly which deteriorate the quality of water and cause various health issues and water borne diseases which influence the quality of people's life. Major cause of regular increase in this parameter due to increase population, industrialization, urbanization and use of pesticides and fertilizers it affect the environment and ecology of water. Government has implemented various plan and project related to safety of potable water.

## Conclusion

Water is essential for all living organism but impure and infected water are the reason of many health issues and water borne diseases. We know water borne disease is major cause of morbidity and mortality. Ongoing to the large number of people getting infected with water borne diseases, there is need to test the water samples from taps and river and subject the samples to specific tests in order to understand the actual source of contamination and spread of the diseases.

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**Table 1: WHO Water Quality Index**

Parameter	Unit	Guideline	Guideline remarks	Guideline type
pH		6.5-8	Minimum-maximum	Acceptability
Turbidity	NTU1	5	Appearance 0.1 median for disinfection	Acceptability
Hardness	mg L-1	200	500 taste threshold	Acceptability
Total dissolved Solid	mg L-1	600	600-1000;taste	Acceptability
Biological oxygen Demand	mg L-1	10	-	-
Chemical oxygen Demand	mg L-1	100	-	-
Fluoride	mg L-1	1.5	Adjust for volume water consumed	-
Nitrate	mg L-1	50	Short term exposure	Health
Faecal coli form	counts/ 100mL	0	-	Health

Source: WHO guideline 2017

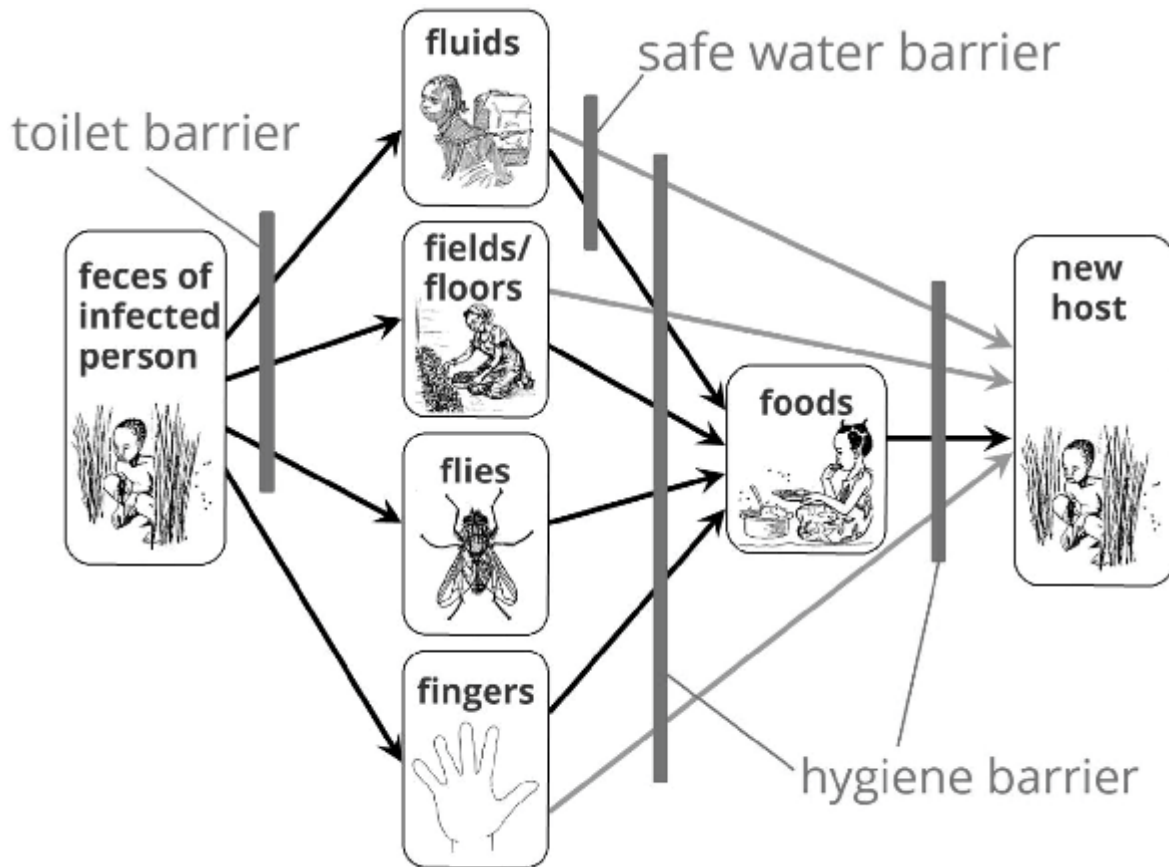


Figure 1: Picture source: water1<sup>st</sup>org.