

Analytical study of ground water in Darbhanga city and its impact upon human health

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Abstract

Water analysis was conducted at DLWTL (DMCH), Darbhanga during 2019-21. The data regarding ground water pollution and its impact upon human health was obtained and compiled through various published and relevant books. Water covers about 70% Earth's surface. Safe drinking water is a basic need for all humans' life. The WHO reports that 80% diseases are waterborne. Households sewage, Sanitary leakage, Population growth, Plastics and polythene bags, Other Hard solid wastes, Pesticides & fertilizers, Improper municipal dispose off, Urbanization, Weak management system, Industrialization and agricultural run-off are major sources of ground water pollution in Darbhanga district. 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 hepatitis, skin infection, cholera, typhoid, encephalitis, poliomyelitis and gastrointestinal are spreading through polluted water. Accumulation of unwanted chemical in human body may also cause cancerous and other types of disease. 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.

Keywords: waterborne, sanitary, pesticides, industrialization, encephalitis, poliomyelitis, gastrointestinal, cancerous, solid wastes

Introduction

Ground water pollution occurs when unwanted materials mix with water, changes the quality of water ^[1] and harmful to environment and human health ^[2]. Water is an important natural resource used for drinking and other developmental purposes in our lives ^[3]. Safe drinking water is necessary for human health all

over the world. Being a universal solvent, water is a major source of infection. According to world health organization (WHO) 80% diseases are water borne. Drinking water in various countries does not meet WHO standards ^[4]. 3.1% deaths occur due to the unhygienic and poor quality of water ^[5].





Fig 1: (a). Map of India showing Bihar location. (B).map of Bihar showing Darbhanga location.

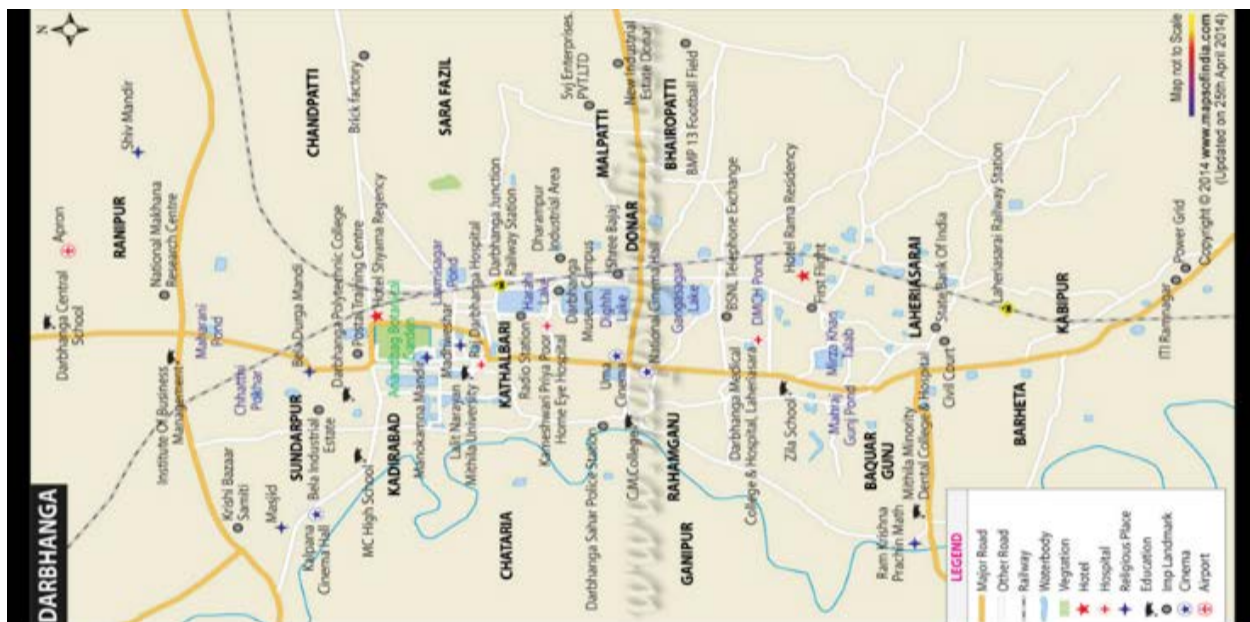


Fig 1(c): Location and geology map of the study area showing sample locations.

Discharge of household sewages, sanitary leakage, plastic & polythene bags, other solid wastes, pesticides & fertilizers, factory effluent wastes, agricultural run off and atmospheric deposition are major causes of water pollution in the Darbhanga city of Bihar. Heavy metals and wastes that disposed off and factory waste can accumulate in ground, ponds and river, proving harmful to humans and animals. Toxins from pharmaceutical wastes, sanitary leakage and factory wastes are the major cause

of immune suppression, reproductive failure and acute poisoning. Infectious diseases like cholera, typhoid fever [6] and other diseases gastroenteritis, diarrhea, vomiting, skin and kidney problem are spreading through polluted water [7]. Human health is affected by the direct damage of plants and animal nutrition. Water pollutants are killing fishes and other organisms that serve as food for human. Insecticides like DDT concentration is increasing along the food chain. These insecticides are harmful

for humans [8].

Folliwings are the major sources of water pollution in Darbhanga city –

1. Households sewage
2. Sanitary leakage
3. Deposition of rain water
4. Plastics and polythene bags
5. Other Hard solid wastes
6. Pesticides and fertilizers
7. Improper municipal dispose off
8. Urbanization
9. Weak management system
Industrialization
10. Population growth

WHO is reported that 60 to 70% water pollution is caused by the domestic sewage. Waste from the households and factories like pharmaceutical, textile, pesticides, pulp and paper, machinery etc are polluting the ground water [9]. Polluted ground, ponds and 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 into ponds and 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 factories effluents that is drained into ponds and river without treatment is the major cause of water pollution [9]. Hazardous material discharged from the factories is responsible for surface water and ground water contamination. Contaminant depends upon the nature of factory. Toxic metals enter into water and reduced the quality of water [10]. 25% pollution is caused by the factories and is more harmful [10]. Increasing population is creating many issues but it also plays negative role in polluting the water.

Population growth leads to increase in solid waste generation [11]. Solid and liquid waste is discharged into ponds and 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 [10]. Government is incapable to supply essential needs to citizens because of increasing number of population. Sanitation facilities are improper in Darbhanga urban areas. Polythene bag and plastic waste is a major source of pollution. Waste is thrown away by putting it into plastic bags [10]. It is estimated that 1.25 lakhs out of 3.5 lakhs people of urban areas defecate in open. 60% people are using flush latrines and 30% are using pit latrines in urban. Sanitary leakage and open latrine are also caused adverse effects on people of Darbhanga city. Urbanization can cause many infectious diseases. Overcrowding, unhygienic conditions, unsafe drinking water are major health

issues in urban alongwith rural areas. One third of district population is susceptible to disease [9].

Insecticides and pesticides are used to kill bacteria, insects and different germs. Chemical containing pesticides are directly polluting the ground water and affect the quality of water. If pesticides are excess in amount or poorly managed then it would be hazardous for agriculture ecosystem [11]. Only 60% fertilizers are used in the soil other chemicals leached into soils polluting the water, algae and cyanobacteria are rich in polluted water and excess Phosphate & Nitrates run off leads to eutrophication. Residues of chemicals mix with ponds and river water due to flooding, heavy rainfall, excess irrigation and enter in the food chain. These chemicals are lethal for living organisms and many vegetables and fruits are contaminated with these chemicals [9]. Trace amounts of pharmaceutical in ground water also causes water pollution and it is dangerous to human health.

Impacts of ground water pollution on human health

Definitely, There is a greater association between pollution and health problems. Disease causing microorganisms are known as pathogens and are spreading disease directly among humans. Some pathogens are worldwide some are found in well-defined area [9]. Many water borne diseases are spreading man to man [12]. Heavy rainfall and floods are related to extreme weather and creating different diseases in the Darbhanga city of Bihar. Approx 40% of the population of this town depends on food for vegetables that are grown in contaminated water. Many waterborne infectious diseases are linked with faecal pollution of water sources and results in faecal-oral route of infection [13]. Health risk associated with polluted water includes different diseases such as respiratory disease, cancer, diarrheal disease, neurological disorder and cardiovascular disease. Nitrogenous chemicals are responsible for cancer and blue baby syndrome [14]. Urban people don't have facility of treated water and use unprocessed water. Poor people are at greater risk of disease due to improper sanitation, hygiene and water supply. Contaminated water has large negative effects in those women who are exposed to chemicals during pregnancy; it leads to the increased rate of low birth weight as a result fetal health is affected.

Worst quality water destroys the crop production and infects our food which is hazardous for aquatic life and human life [7]. Pollutants disturb the food chain and heavy metals, especially iron affects the respiratory system of fishes and stunt growth of plants. An iron clog into fish gills and it is lethal to fishes, when these fishes are eaten by human leads to the major health issue. Metal contaminated water leads to hair loss, liver cirrhosis, renal failure [15] and neural disorder. There are following parameters which show the level of pollution in different sampling stations of Darbhanga city.

Table 1: Flactuation of various parameters during different sampling stations.

Sampling Stations	pH	Total hardness (Mg/l)	Turbidity (NTu)	Conductivity (Mho)	TDS (Mg/l)	Faecal coliform (C/100ml)	Iron (Mg/l)
Bela	8.50	180	1	569	372	Nt	0.71
Kadirabad	8.41	240	1	632	465	1	0.89
Darbhanga junction	8.22	280	2	656	488	2	1.07
Donar	8.18	340	2	725	586	2	1.10
Allapatti	8.16	430	3	823	640	2	1.18
Benta	8.24	460	3	884	674	2	1.14
Laheriasarai court	8.46	310	1	532	412	Nt	0.82

Bacterial diseases

Untreated drinking water, sanitary leakage and faecal contamination of water in these areas (except Bela, Kadirabad and Laheriasarai court), is the major cause of diarrhea. Bacteria – such as campylobacter, Clostridium difficile, Escherichia coli spread diarrhea approx upto 15%. Fever, abdominal pain, nausea, headache are major symptoms of diarrhea. Good hygienic practices and use of antibiotics can prevent this disease. Disease cholera is caused by the contaminated water. Vibrio Cholerae is responsible for this disease. This bacterium produces toxins in digestive tracts. The symptoms of this disease are watery diarrhea, nausea, vomiting and watery diarrhea leads to dehydration and renal failure. Anti-microbial treatment is used to get rid of this disease. Shigellosis is a bacterial disease caused by Shigella bacteria. It affects the digestive tract of humans and damages the intestinal lining. Watery or bloody diarrhea, abdominal cramps, vomiting and nausea are symptoms and it can be cured with antibiotics and good hygienic practice. Salmonellosis infects the intestinal tract. Salmonella bacteria are found in contaminated water and it results in inflammation of intestine and often death occurs. Antibiotics are prescribed for this disease [16].

Viral diseases

Major viral disease like hepatitis is caused by contaminated water in these areas and infects the liver. Jaundice, loss of appetite, fatigue, discomfort and high fever are symptoms of hepatitis. If it persists for a long time it may be fatal and results in death. Vaccine is available for hepatitis and by adopting good hygienic practice; one can get rid of this disease [16]. Encephalitis is inflammatory disease spread by bite of infected mosquitoes. Culex mosquito lays their eggs in contaminated water. Most people don't show any symptoms but some symptoms are headache, high fever, muscle stiffness, convulsions however in severe cases coma and paralysis results. No vaccine is available for this disease [16]. Poliomyelitis virus is responsible for poliomyelitis. Sore throat, fever, nausea, constipation and diarrhea and sometimes paralysis are symptoms of poliomyelitis. Vaccine is available for this disease. Gastroenteritis is caused by different viruses including rotaviruses, adenoviruses, calciviruses and Norwalk virus. Symptoms of gastroenteritis are vomiting, headache and fever. Symptoms appear 1 to 2 days after infecting. Sickness can be dangerous among infants, young children and disabled person [16].

Parasitic diseases

Parasitic disease cryptosporidiosis is caused in these areas by the cryptosporidium parvum. It is the disease and symptoms are diarrhea, loose or watery bowls, stomach cramps and upset stomach. Cryptosporidium is resistant to disinfection and affects immune system and it is the cause of diarrhoea and vomiting in humans [17]. Galloping amoeba is caused by the Entamoeba histolytica and affects stomach lining. This parasite undergoes cyst and non-cyst form. Infection occurs when cyst found in contaminated water and it is swallowed. Symptoms are fever, chills and watery diarrhea. According to WHO, diarrheal cases are about 4 billion and results in 2.2 million deaths in world [18]. Giardiasis is caused by Giardia lamblia. Cells of intestinal lining may become injure. Giardia is resistant to wintry temperature and disinfectant. Sometimes it is known as travelers' disease. People

suffering from giardiasis have symptoms bloating, excess gas, watery diarrhea and weight loss.

Conclusion and recommendations

Ground Water pollution is a major issues in Darbhanga city and community is facing worst results of polluted water. Major sources of water pollution are discharge of domestic and agriculture wastes, sanitary leakage, population growth, plastics and polythene bags, other hard solid wastes, pesticides and fertilizers, rain deposition, improper municipal dispose off, urbanization, weak management system. Bacterial, viral and parasitic diseases are spreading through polluted water and affecting human health. Now a days many diseases ie. cancer, hormonal imbalance etc are caused due to accumulation of harmful chemicals in human body. It is recommended that there should be proper waste disposal system and waste should be treated before entering into ground, ponds and river. Educational and awareness programs should be organized to control the ground water pollution.

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