WATER QUALITY AND PUBLIC HEALTH

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Water is important for human life. Safe drinking water influences the quality of health and productivity.

Water quality refers to the physical, chemical and biological characteristics of water.

Human body consists of 60 to 70% water. Water is available in large quantity in our blood, muscles, brain and lungs.

The body use water to regulate its temperature and also water acts as a base for all nutrients to travel all through the body.

Water makes up 60 per cent of body weight; blood plasma contains more than 90% of water, bone has 20 per cent of water.
Today one of the major problems of drinking water is that water is not safe.

3.4 millions people killed each year by water-related diseases,

2.1 millions children are die from diarrhea disease stemming from lack of access to safe water, inadequate sanitation and poor hygienic.
In developing countries four-fifth of all the illnesses are caused by water.

Diarrhea is being the leading cause of childhood death.

Water borne diseases are any illness caused by drinking water contaminated by human or animal faces, which contain pathogenic microorganisms.
Worldwide, about 2.3 billions people suffer from diseases that are linked to water problems. The World Health Organization (1993) has estimated that in India 21% of all communicable diseases (11.5% of all diseases)

The poor quality of drinking water is a major cause of diseases including jaundice, typhoid and diarrhea. These diseases are major killers almost around the world.
<table>
<thead>
<tr>
<th>Concentration of Hydrogen Ions in H₂O (molarities)</th>
<th>pH</th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000,000</td>
<td>pH=0</td>
<td>Battery Acid, Strong Hydrofluoric Acid</td>
</tr>
<tr>
<td>1,000,000</td>
<td>pH=1</td>
<td>Hydrochloric Acid Secreted by Stomach Lining</td>
</tr>
<tr>
<td>100,000</td>
<td>pH=2</td>
<td>Lemon Juice, Vinegar, Stomach (Gastric) Acids</td>
</tr>
<tr>
<td>10,000</td>
<td>pH=3</td>
<td>Orange Juice, Grapefruit Juice, Soda</td>
</tr>
<tr>
<td>1,000</td>
<td>pH=4</td>
<td>Tomato Juice, Acid Rain</td>
</tr>
<tr>
<td>100</td>
<td>pH=5</td>
<td>Coffee, Soft Water</td>
</tr>
<tr>
<td>10</td>
<td>pH=6</td>
<td>Urine, Saliva</td>
</tr>
<tr>
<td>1</td>
<td>pH=7</td>
<td>“Pure” Water</td>
</tr>
<tr>
<td>1/10</td>
<td>pH=8</td>
<td>Sea Water</td>
</tr>
<tr>
<td>1/100</td>
<td>pH=9</td>
<td>Baking Soda</td>
</tr>
<tr>
<td>1/1,000</td>
<td>pH=10</td>
<td>Milk of Magnesia, Great Salt Lake</td>
</tr>
<tr>
<td>1/10,000</td>
<td>pH=11</td>
<td>Ammonia Solution</td>
</tr>
<tr>
<td>1/100,000</td>
<td>pH=12</td>
<td>Soapy Water</td>
</tr>
<tr>
<td>1/1,000,000</td>
<td>pH=13</td>
<td>Bleach, Oven Cleaner</td>
</tr>
<tr>
<td>1/10,000,000</td>
<td>pH=14</td>
<td>Drain Cleaner</td>
</tr>
</tbody>
</table>
surface & groundwater pollution

- urban pollution
- runoff's dirt & oil
- parking, roads, cars
- agricultural pollution
- fertilizers & pesticide
- animal waste
- industrial pollution
- industrial chemicals
- manufacturing facilities
- cultural eutrophication
- human activities
- organic pollution
- landfills pollution
- improperly built
- or maintained

- oil tankers
- oil, petrochemicals

- construction, roadwork
- tanks & pipelines
- tanks with petroleum
dust, oil, grease, chemicals
Groundwater Contamination

- Landfill
- Seepage
- Percolation
- Runoff
- Well
- Leakage
- Septic Tank
- Aquifer
- Unconfirmed Aquifer
- Pesticides Fertilizers
<table>
<thead>
<tr>
<th>Parameter</th>
<th>BIS Guideline value (maximum allowable)</th>
<th>General &amp; Health effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dissolved solids</td>
<td>2000 mg/L</td>
<td>Undesirable taste; gastro intestinal irritations; corrosion or incrustation</td>
</tr>
<tr>
<td>PH</td>
<td>6.5-8.5</td>
<td>Affects mucous membrane; bitter taste; corrosion; affects aquatic life</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>600 mg/L</td>
<td>Boiled rice turns yellowish</td>
</tr>
<tr>
<td>Hardness</td>
<td>600 mg/L</td>
<td>Poor lathering with soap; deterioration of the quality of clothes; scale forming; skin irritation; boiled meat and food become poor in quality</td>
</tr>
<tr>
<td>Calcium</td>
<td>200</td>
<td>Poor lathering and deterioration of the quality of clothes; incrustation in pipes; scale formation</td>
</tr>
<tr>
<td>Magnesium</td>
<td>100</td>
<td>Poor lathering and deterioration of clothes; with sulfate laxative</td>
</tr>
<tr>
<td>Iron</td>
<td>1.0</td>
<td>Poor or sometimes bitter taste, color and turbidity; staining of clothes materials; iron bacteria causing slime</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.3</td>
<td>Poor taste, color and turbidity; staining; black slime</td>
</tr>
<tr>
<td>TYPE</td>
<td>CAUSE</td>
<td>DISEASES</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>Chemical</td>
<td>Lead</td>
<td>Infants and Children: Delays in Physical or mental development. Adults: Kidney and High B.P</td>
</tr>
<tr>
<td></td>
<td>Arsenic</td>
<td>High risk of getting Cancer. Skin damage or circulatory system problems</td>
</tr>
<tr>
<td></td>
<td>Fluoride etc.</td>
<td>Bone diseases (pain and tenderness of bones). Mottled teeth in children</td>
</tr>
<tr>
<td>Microbial</td>
<td>Bacterial infections</td>
<td>Typhoid, Cholera, Bacillary dysentery</td>
</tr>
<tr>
<td></td>
<td>Viral infections</td>
<td>Infectious Hepatitis (jaundice)</td>
</tr>
<tr>
<td></td>
<td>Protozoa infections</td>
<td>Amoebic dysentery</td>
</tr>
</tbody>
</table>
In India the agencies like Indian Council of Medical Research (ICMR), Bureau of Indian Standard (BIS), and Ministry of Works and Housing (MHW) have formulated certain drinking water standards which are being followed by different authorities.
Fluoride Contamination - India

Most Affected:
- Rajasthan
- Gujarat
- Andhra Pradesh

Source of Information:
1) UNICEF State of Art Report, 1999
2) FR & RDF data bank

www.ancollege.org
The diseases which are spread through the microbial contamination of water are those caused by entire bacteria and from like cholera acute gastroenteritis, diarrhea, dysentery, typhoid, viral hepatitis A and E and Poliomyelitis.

Cholera: is acute water borne disease caused by the bacterium. Its scientific name is Vibro cholera. Diarrhea, typhoid, Hepatitis, Dysentery

Diarrhea disease impact on children most severely, killing more than 2 millions children a year in the developing world. World Health Organization
The level of contaminants, which available in drinking water are seldom high enough to cause acute (immediate) health effects. Example of acute health effects are nausea, lung irritation, skin rash, vomiting, dizziness, and even disease contaminants are more likely to cause chronic health effects that occur long often repeated exposure to small amounts of a chemical.

Examples of chronic health effects include cancer, liver and kidney damage, disorder of nervous system damage to the immune system and birth defects.
Typhoid: *Salmonella typhii*
Ingestion of contaminated food, water, milk, unwashed raw vegetable and flies

Continuous fever which progressively increase day by day, the temperature will be g higher in the evening than the morning accompanied by body aches, headache and constipation.

Hemorrhage from an ulceration in the small intestine.
Cholera: *Vibrio cholera*

Ingestion of water or food contaminated by the bacteria from the stool of a cholera patient.

Painless Diarrhea followed by vomiting patient may pass 30 to 40 stools per day which soon become typically watery and colourless with flabes of mucous floating in them.
Infective hepatitis
Hepatitis virus
Stools that contain virus contaminating the water and food Loss of appetite nausea, vomiting and diarrhea accompanied by fever. The urine is dark coloured. Eye and skin have yellow coloration.
The Essential Public Health Services

- Evaluation and continuous quality improvement
- Identifying and sharing best practices; participation in research
- Community health assessment; registries
- Investigate infectious water-, food-, and vector-borne disease outbreaks
- Health education and health promotion
- Partnerships with private sector, civic groups, NGOs, faith community, etc.
- Public health workforce and leadership
- Investigate infectious water-, food-, and vector-borne disease outbreaks
- Access to care, link with primary care
- Develop policies
- Enforce laws
- Mobilize community partnerships
- Inform, educate, empower
- Strategic planning; community health improvement planning
THANK YOU