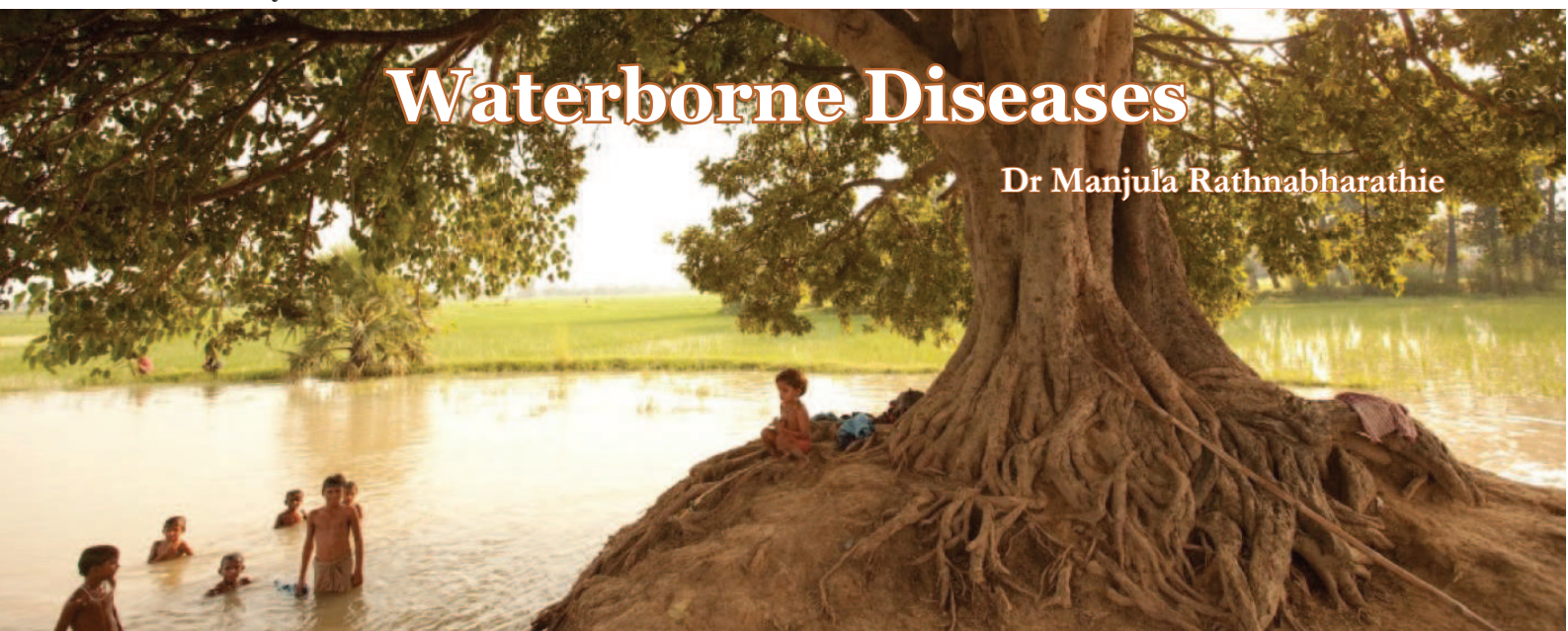


Waterborne Diseases

Dr Manjula Rathnabharathie



With its many uses water is the most precious global resource. Water is essential for life, but it can also spread illnesses when it is contaminated by disease causing organisms. Clean and safe water is a critical challenge which needs to be available sustainably to human health and life.

The term water born disease implies the direct spread of diseases caused by microbial pathogens or chemical contamination of water. Waterborne diseases are numerous which results from consuming water contaminated with microbial pathogens or chemical compounds.

Global Prevalence of Waterborne Diseases

Water-borne disease outbreaks have the potential to be rather large and of mixed etiology, but the actual disease burden is difficult to approximate, and

most likely underestimated due to the diversity of occurrence and lack of proper surveillance systems. Current extreme weather conditions associated with global climate change events affects water availability, quality, access as well as contamination, posing a threat to human populations.

There are various forms and manifestations of waterborne diseases, but the universal form of disease occurrence is diarrhoea. WHO had estimated in their disease burden studies that there are about 2.2 million people inclusive of 1.9 million children dying of diarrhoeal diseases each year. This is almost equivalent to 20 jumbo jets crashing every day. According to WHO World Health Report 2001, it was estimated that in addition to this 2 million deaths, waterborne diseases had accounted for 59.7 million DALLYs lost due to diarrhoea.

Out of this SEARO [South East Asia Region] accounted for the highest lost.

Types of water borne diseases

Water borne diseases can be categorized as infectious and non-infectious diseases. Infectious diseases are mainly due to the contamination of water sources by the microbial pathogens, and noninfectious type includes diseases occurring due to water contamination by chemicals, radioactive substance etc. Usually the waterborne diseases resultant from infectious origin are short term, and consequences are easily visible. The hardest part is that when water is contaminated with noninfectious substances, the resultant effects are long term and difficult to trace as well as to control.

Where are we?

In comparison to other countries in the region, Sri Lanka reports

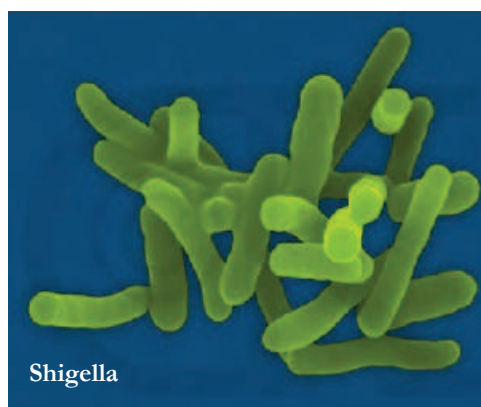
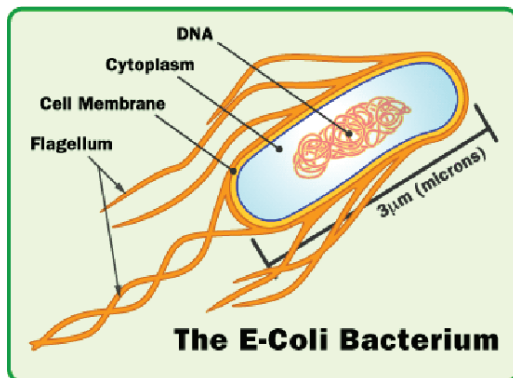
Waterborne Diseases

Table 1 Major pathogens causing waterborne diseases

Pathogenic organism		Major Targeted organs	Major symptoms
Bacteria	E.coli	Intestines	Diarrhoea
	Shigella	Intestines	Diarrhoea/dysentery
	V.cholera*	Intestines	Diarrhoea
	Salmonella typhi Salmonella paratyphi	Intestines	Fever , abdominal pain, constipation, sometimes diarrhoea
Virus	Hepatitis A	Liver	Jaundice
	Hepatitis E	Liver	Jaundice
	Rota virus	Intestines	Diarrhoea
	Polio virus**	Nervous system	Paralysis of limbs
Parasites	E. histolytica	Intestines	Diarrhoea
	Giardia	Intestines	Diarrhoea
	Hook worm	Intestines	Weakness/anaemia
	Other intestinal worms	Intestines	Weakness/anaemia , sometimes diarrhoea

*not reported since 2003 from Sri Lanka

** not reported since 1993 from Sri Lanka



lower rates of waterborne diseases, even though it is the commonest contributory factor for under five year

malnutrition. Waterborne diseases occur mostly as either acute watery diarrhoea or dysentery. During the last 20 years, admission to government hospitals due to diarrhoeal [waterborne] diseases has been fluctuating between 676.1 and 961.3 cases per 100,000 populations.

During 2001, the cases treated in government hospitals for diarrhoeal diseases per 100,000 populations increased to 857.3 from 742.8 in 2000, and these have been ranked as the sixth leading cause of hospitalization. The last Demographic and Health Survey [2007] findings have shown that under five year old diarrhoeal incidences was 3.5% in Sri Lanka. Apart from acute

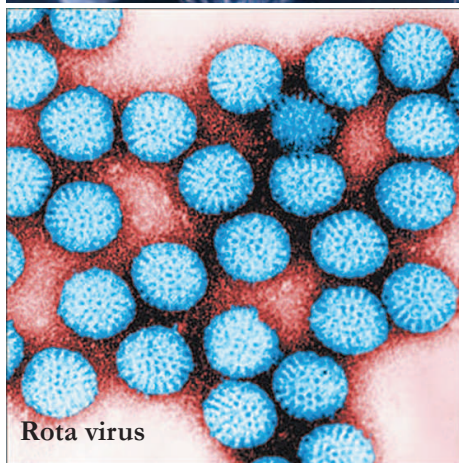
watery diarrhea, dysentery, hepatitis and typhoid are the commonest waterborne diseases seen in Sri Lanka.

Noninfectious waterborne diseases

Contamination of water sources by chemical compounds is a growing threat worldwide. There are certain countries where naturally occurring chemicals such as arsenic and fluoride occurring in ground water, but in most circumstances this had become a manmade threat. Contamination of water bodies by agricultural runoffs and industrial waste water is a growing public health problem where no proper data source is available, as well as weak regulations which would need a broader consideration especially in developing countries.



Hepatitis A



Rota virus



Hook worms

are problems faced by different countries. Greater the poverty level, the lesser is the chance for better sanitation and safe water.

Challenges ahead

Waterborne diseases are resultant from exposure to waterborne infectious pathogens, or from exposure to waterborne chemicals and radiological contaminants. Waterborne diseases are essentially environmental health related issues as these are related with polluted water, sanitation and hygiene and these three are intertwined determinants of waterborne disease occurrence. Unlimited human intervention in terms of rapid urbanization and industrialization invariably cause population growth, poor sanitary facilities, poverty, and

poor planning, in polluting water sources by infectious microbial pathogens and toxic chemicals. In addition to the above mentioned scenario, political and economic instability in developing countries together with unawareness of the issues among general population and weak regulations, has aggravated the problem.

Increasing economic disparity among populations and making poorer segments more vulnerable for water related diseases, together with different socio cultural practices specific for different ethnic groups in relation to water consumption,

In majority of developing countries the real burden of waterborne associated diseases are grossly underestimated due to poor surveillance facilities.

According to WHO and UNICEF figures, in 2000 nearly 2.5 billion people in the world lacked acceptable means of sanitation, while 1.2 billion people were estimated to lack safe drinking water. Hence these water deficient populations in the world are at risk of getting ill due to the unsafe water as well as public health issues of monitoring, surveillance and prevention.

Waterborne Diseases

Attributing water pollution to a disease is more often neglected, while evidence is collected of further cases to occur which can result in much higher level of disease due to persistence or recurrent contamination. Mercury poisoning in Minimata is a classic example of delayed attribution of water related cause for a disease.

Ground water becoming gradually unfit for consumption due to seepage of microorganisms from polluted surface waters of rivers, is a future challenging issue that should be considered by all stake holders in the field.

Noninfectious waterborne diseases increasingly recognized as a public health problem, requires different type and

complex surveillance methods from the traditional systems based on microbiological agents.

Accurate and timely diagnosis of waterborne disease by the medical community is critically important since the medical, public health, and economic consequences of a waterborne disease outbreak are high, particularly if public drinking water is contaminated. Water consumers are frequently unaware of the potential health risks associated with exposure to waterborne contaminants, and often consult medical practitioners who are unfamiliar with water contamination from biological, chemical or radiological hazards and their subsequent impact on human health.

Increased population, mobility and travel to different countries have globalized the risk of spreading waterborne disease outbreaks, and furthermore it is difficult to keep these illness confined to few geographical areas. Priority consideration should be given for waterborne diseases in the context of the impact of climate change including the effects of global warming on water habitats, and adverse weather events threatening the security of water supplies as well as the emergence and re-emergence of waterborne diseases, which are the invariable results of adverse climatic conditions.

Preservation of water quality and prevention of water-related disease is a complicated task requiring a

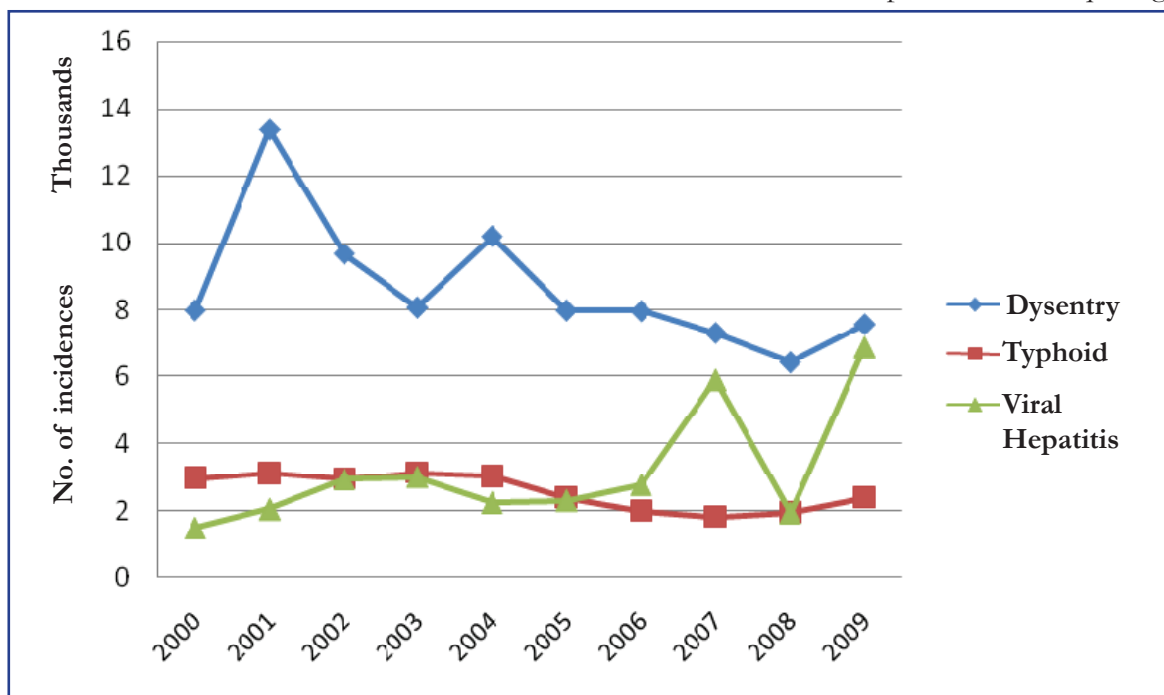


Figure 1 Incidence of dysentery, typhoid and vital hepatitis for the past 10 years in Sri Lanka - Data Source ; Epidemiology Unit

Table 2 Main chemicals causing noninfectious waterborne diseases

Chemical	Organ affected	Major health effect
Arsenic	Skin, lung	Hyperpigmentation, skin cancers, lung cancer, Acute toxicity causes gastrointestinal symptoms
Fluoride	Bones	Bone fractures, bone pain and tenderness,
Nitrates	Circulatory system	Methaemoglobinaemia [blue baby syndrome]
Cadmium	Lungs, Kidney	Acute inhalation may be life threatening Chronic exposure cause kidney damage[chronic renal failure]
Mercury	Lung, nervous system, kidney	Lung damage Chronic poisoning cause Personality disorders, restlessness, anxiety, sleep disturbances Kidney damage[chronic renal failure]
Lead	Nervous system Intestines	Headache, irritability, abdominal pain Chronic exposure may cause memory deterioration, prolong reaction time

coordinated effort from many diverse disciplines including physicians, healthcare providers, epidemiologists, microbiologists, academic scientists, local and national health authorities, public and environmental health specialists, water engineers and water purveyors. Since majority of waterborne disease-related issues occur in developing countries where the highest population burden persist, capability of the governments of these countries to bare the cost needed for future preventive strategies, and also the political backup needed to coordinate globally, are international issues that should be addressed.

Waterborne diseases are the major killers of under five year old children worldwide. It is also attributed to child morbidity in terms of malnutrition in alarming rates. Waterborne diseases as a result of water pollution, are a threat to the global environmental sustainability. Both of these are Millennium Development Goals, the achievements of which are still not within sight.

Prevention of waterborne diseases and health effects of water contamination are vital to global health due to the fact that safe drinking water is a required cornerstone for public health. As this article has highlighted

there are numerous barriers and obstacles to be overcome to provide quality safe drinking water, as well as identifying water related diseases at early stages. Higher female literacy rate, free education and free health sciences with developed low cost transport systems are prime factors for the country to rise against waterborne diseases.

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