

Water Related Diseases and its Medical Importance

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Running Title: Water related diseases and its medical importance

Abstract: Introduction: Water related diseases are the leading Cause of mortality in all over the world and the permanent barrier of development in most developing countries. About 3.4 million of people that most of them young children were died from water related diseases such as diarrhea due to cholera, Typhoid fever and dysentery yearly. Objective: detection of academic and research evidences about main characteristics, epidemiology, mode of transmission and update promotion regarding of treatment and prevention of Water related diseases. Method and Materials: In this Review Article from Authorized academic sites and resources such as Pub Med ‘Google Scholar ‘HINARI and Ministry of public health site used. Result: in this research detected that Bacterial infections which could be transferred by contaminated Water included *Compylobacter Jejuni*, Typhoid fever infection, paratyphoid fever infection, others almonella infections, *Yersiniaenterocolitica*, shigella, cholera, enterocolitica *Escherichia coli*, Tularemia, *Legionella* and *Leptospirae*. The parasites which could be transferred by contaminated Water included *Entamoeba Histolytica*, *Giardia Lamblia*, *Cryptosporidium*, *Schistosomiasis* and *Toxoplasma gandii*. The Viruses which could be transferred by contaminated Water included enterovirus, norovirus and Hepatitis A virus. It is necessary to be mentioned that Legionnaires disease is transferred by Air scrubber. Conclusion: The Prevalence of Water related disease is a continuous and permanent in developing countries and also in developed countries with good infrastructures. in this research founded that different Microorganisms such as Bacteria, Virus and Parasite could transfer through Contaminated Water.

Keywords: Water, Water related disease, Water born diseases and Infectious diseases.

1. Introduction

Water-associated diseases are a significant cause of morbidity and mortality worldwide and are a barrier to sustainable development in many developing countries. Some 3.4 million people, many of them young children, die each year from water-borne diseases, such as intestinal diarrhea (cholera, typhoid fever and dysentery), caused by microbial contaminated water supplies that are linked to deficient or non-existent sanitation and sewage disposal facilities. In Africa, it has been estimated that every child has five episodes of diarrhoea per year and that 800, 000 children die each year from diarrhoea and dehydration⁽¹⁾

The situation is particularly serious in many war affected areas where the war affected groups such as internally displaced persons (IDPs) and refugees mostly live in extreme conditions of poverty coupled with poor housing conditions, limited access to food and medical services, inadequate supply of safe drinking water and sanitary disposal of fecal waste, make the vulnerable groups especially women, children, older people, physically and mentally disabled people, infants and children who are already weak and sick expose to waterborne diseases like malaria, diarrhea, cholera, typhoid fever and dysentery etc⁽²⁾ The importance of the impact of water-associated diseases on human health has been recognized as a major threat to

sustainable human development⁽³⁾. WATER IS ESSENTIAL FOR LIFE. Water is indispensable for human health and well-being, and is crucial for sustainable development. Throughout history, civilizations have flourished around rivers and major waterways. Although water is essential for life, it can also cause devastating effects as an effective carrier of pathogens, able to transmit disease to a large proportion of the population in a very short time span. Waterborne illness has plagued humans throughout history. Cholera was a feared disease that caused large pandemics during the 19th century. John Snow, a physician working in London during the large cholera epidemics in the middle of the 18th century was sceptical to the then dominant miasma-theory of transmission. He believed the disease was transmitted by water contaminated with faeces from cholera victims⁽¹⁾. By interviewing local residents and cholera victims, he studied the pattern of illness according to water supply, and managed to pinpoint one well located centrally in the cholera victims' neighborhood – the Broad Street Pump. He later created a map to illustrate how the cases were clustered around this well. John Snow's work was an important event in the history of waterborne illness, and he is regarded as one of the founders of the science of applied epidemiology. During the 20th century, global water use increased six-fold, more than twice the rate of population growth. In Europe, water consumption in private households varies around 100 – 250

litres per person-day⁽²⁾. Norway is among the countries with the highest household water consumption per person, with an estimated 224 litres per person-day⁽²⁾. Most of the water used in households is for toilet flushing, bathing and washing machines, and as little as 6% is for drinking and cooking. However, the largest personal water use is the “hidden water use” the water needed for production of food and personal commodities. For human survival, the absolute minimum daily water requirement is only about five litres per day, whereas a total daily requirement, including water used for sanitation, bathing, and cooking, is estimated to be about 50 litres per person⁽³⁾. In developing countries, 20-30 litres per person-day are considered enough to meet basic human needs⁽⁴⁾. In addition to private water consumption, a large amount of water is used for irrigation in agriculture, industrial processes and cooling of electric power plants. Lakes and rivers are 11 recipients of agricultural runoff and wastewater from communities and industry. Altogether an increasingly high pressure is put on the available fresh water sources. In December 2003, the United Nations General Assembly proclaimed the years 2005 to 2015 as the International Decade for Action ‘Water for Life’⁽⁵⁾. The Millennium Development Goal number 7 on environmental sustainability includes a target of reducing by half the proportion of people without access to safe drinking water by 2015 and to stop unsustainable exploitation of water resources. Although waterborne diseases are typically considered to be a problem in developing countries, there is an increasing attention also in developed countries to the public health problem of waterborne illness. Here, outbreaks of the classical waterborne bacterial diseases, such as typhoid and cholera, no longer occur. However, other pathogens and challenges have emerged and waterborne infections continue to be a challenge to public health even in highly developed industrial countries at the beginning of the 21st century⁽⁵⁾.

Infectious agents associated with water

“I discovered, in a tiny drop of water, incredibly many very little animalcules, and these of diverse sorts and sizes. They moved with bendings, as an eel always swims with its head in front, and never tail first, yet these animalcules swam as well backwards as forwards, though their motion was very slow.”

Antony van Leeuwenhoek (1632 –1723) Many infectious agents have water as their reservoir or are able to survive in water for some time, thus representing a potential threat to humans. Below I describe briefly some of the most important waterborne pathogens and the diseases they cause, with emphasis on those that are of: *Campylobacter jejuni*, Typhoid fever infection, paratyphoid fever infection, other salmonella infections, *Yersinia enterocolitica*, *Shigella* (Bacillary dysentery), cholera, enteropathogenic infection, Tularemia, Legionella, Entamoebahistolycita, Giardialamblia, Schistosomiasis and Toxoplasma gondii⁽⁵⁾.

Objective: detection of academic and research evidences about main characteristics, epidemiology, mode of transmission and update promotion regarding of treatment and prevention of Water related diseases.

Research Question: Which Bacteria, parasites, fungi, toxins and chemical contaminants were transferred by water?

2. Literature Review

The term water-associated diseases are reserved largely for infections that are predominantly transmitted through contact with or consumption of infected water. According to Bradley, 1974 at T. E. Funari, Herbst .Kistemann, S. and Rechenburg. A, (2011) there are five different categories of water-associated diseases, depending on the role water plays in the disease transmission process: these include: water-borne diseases, water-washed (water-hygiene) diseases, water-scarce diseases, water-based diseases, vector-borne diseases.⁽⁶⁾

Water-borne diseases are basically —dirty-waterl diseases; mainly attributed to water that has been contaminated by human, animals or chemical wastes (6) meanwhile the Protocol on Water and Health defines “water-related disease” to mean “any significant adverse effects on human health, such as death, disability, illness or disorders, caused directly or indirectly by the condition, or changes in the quantity or quality, of any waters”. These infections are spread by waterborne agents (eg. *E.coli* O157:H7, *Vibrio cholerae* O139), vectors carrying viruses and parasites (eg. dengue, malaria), and water contact (e.g. schistosomiasis) (7). The onset of waterborne diseases in water is enormous and largely attributed by the fact that the World Health Organization (WHO) has estimated that 1.1 billion people globally lack basic access to drinking water resources, while 2.4 billion people have inadequate sanitation facilities, which clearly accounts for many water related acute and chronic diseases. Poverty directly associates with poor housing conditions, over crowded house, lack of access to sufficient clean water and sanitary disposal of fecal waste, and cohabitation with domestic animals that may carry human pathogens (World Bank 2006). Water-borne diseases are characterized by different transmission routes including a) ingestion of contaminants due to unsafe water, sanitation and hygiene e.g. diarrheal disease, b) contact with infected water e.g. schistosomiasis, and c) insect vectors that utilize water to propagate e.g. dengue and malaria (7). Access to safe drinking water, basic sanitation and proper hygiene education could not only prevent diarrheal diseases by nearly 90 % (6) but lead to improved health, poverty reduction and socio-economic development (Fewtrell L, et.al, 2005). Globally, water-borne diseases are the second leading cause of death in children below the age of five years, while childhood mortality rates from acute respiratory infections ranks .⁽⁶⁾

Water-scarce diseases occur due to the lack of water available for washing, bathing and cleaning. Hence, pathogens are transmitted from person to person or from contaminated surfaces to a person and are spread by the faecal–oral route. In particular, eye (trachoma) and skin infections (scabies), as well as diarrhoeal diseases occur under those conditions.⁽⁷⁾

Water-based diseases are caused by organisms, in particular by different species of worms that spend parts of their life-cycle in different habitats. They have spent one

development cycle in aquatic molluscs, and another as fully grown parasites in other animal or human hosts. Because stagnating surface waters, such as reservoirs, are the preferred habitat of parasitic worms, the occurrence of water-based diseases such as dracunculiasis and schistosomiasis can be heavily influenced by anthropogenic activities.⁽⁸⁾

Vector-borne diseases are caused by bites from insects that breed in water. Insect vectors such as mosquitoes transmit diseases such as malaria, Chikungunya and other diseases.⁽⁹⁾

Water-washed (water-hygiene) diseases occur due to the lack of adequate water supply for washing, bathing and cleaning. Pathogens are transmitted from person to person or by contact with contaminated surfaces. Eye and skin infections as well as diarrhoeal illnesses occur under these circumstances. Waterborne pathogens include bacteria, viruses, protozoa and helminthes.⁽¹⁰⁾

3. Method and Materials

In this Review Article from Authorized academic sites and resources such as Pub Med ·Google Scholar ·HINARI and Ministry of public health site used.

4. Result

In this Article review research detected that Bacterial infections which could be transferred by contaminated Water included Compylobacter Jejuni, Typhoid fever infection, paratyphoid fever infection, other salmonella infections, Yersiniaenterocolitica, shigella, cholera, enterocolitica Escherichia coli, Tularemia, Legionella and Leptospirae. The parasites which could be transferred by contaminated Water included Entamoeba Histolytica, Giardia Lamblia, Cryptosporidium, Schistosomiasis and Toxoplasma gandii. The Viruses which could be transferred by contaminated Water included enterovirus, norovirus and Hepatitis A virus. It is necessary to be mentioned that Legionnaires disease is transferred by Air scrubber. The prevalence of Water related disease is a continuous and permanent problem in developing countries and even in developed countries with good infrastructures. those viruses which are transferred by water included viral hepatitis and viral gastroenteritis. In 2008 only eighteen years after finishing of water decade and keeping of good hygiene, lack of accessibility into water supplies was one of the main problem for more than one million humans in all over the world and lack of hygiene and sanitation at least affected 2.4 million humans. Diarrheal disease always transmitted by contaminated water, however it is a causative agent of incidence and mortality in children under five ages in developing countries. Estimated about 1.8 millions of humans died annually due to diarrheal disease that more than 80% of them have occurred among children under five ages. water –borne pathogens mostly transferred by feco – oral route and they caused diarrheal diseases in developing countries as well as developed countries.⁽⁸⁾ according world health organization (2000 and 2004) Quality of water usually depends into physical accessibility and chemical and Microbiological variables. However, physical and chemical contamination of water is important, though the most and

fatal contamination of water is its biological cause⁽⁹⁾ World Health Organization (2000) indicated the widespread health risk is associated with contaminated drinking water by Bacteria. One of the most organism that usually detected in drinking water of Lahore city of Pakistan is Escherichia coli⁽⁹⁾ the presence of E.coli in drinking water had pointed out that water is contaminated with bacteria of human or other animals.⁽¹⁰⁾ Water –related diseases is one of the most causative agent of death and illness in developing countries. The geographical location of the world indicated that more percentage of water related diseases in Asia and Africa continents were included cholera, typhoid fever, paratyphoid fever, Bacillary dysentery (shigellosis), Amoebic dysentery, gastroenteritis and Hepatitis⁽¹¹⁾ specially children of under five ages had suffered from Water borne diseases, so every child has passed ten attach of diarrhea annually. About 15-18% mortality rate of children under five ages is diarrhea, however the incidence of diarrhea is different among adult persons.⁽¹²⁾

Table.1.1: Shows the detection of different Microorganisms in water

Numbers	Type of microorganisms	The presence of Micro organisms in contaminated water
1	Bacteria	Compylobacter jejuni, Typhoid fever infection, paratyphoid fever infection, other salmonella infection, yersinia enterocolitica, shigella, vibrio cholera, entropathogeni E.coli, Tularemia, Legionella and Leptospirae.
2	parasites	Entamoeba histolytica, Giardia lamblia, schistosomiasis, cryptosporidium and Toxoplasmosis.
3	viruses	
4	Microorganisms which are transferred by respiratory tract	Legionnaire diseases

5. Discussion

In this Article Review used twenty related Articles dependent to water related diseases and its result interpreted as follows: Bacterial infections which were transmitted by contaminated water included Compylobacter Jejuni, tyhoid fever infection, paratyphoid fever infection, other salmonella infections, Yersinia enterolitica, shigella infection (Bacillary dysentery), Vibrio cholera infection, Enteropathogenic Escherichia coli, Tularemia infection, legionella infection and leptospirae infection. Parasitic infections which were also transmitted by contaminated drinking water included Entamoebae Histolytica, Giardia Lamblia infection, Cryptosporidium infection, Shistosomiasis infection and Toxopalasma gandii infection. Moreover, viruses which are transmitted by contaminated drinking water were included Enterovirus, norovirus and Hepatitis A virus. It was remarkably considered that Hepatitis A virus could not cause diarrhea except enterovirus and noro virus. Air scrubber had not already recognized as Legionnaires diseases major source for its prevalence. Prevalence of Legionnaires diseases are looks like water related diseases prevalence that are transmitted by respiratory tract through Air scrubber. The findings of twenty Review articles are same with literatures. This research article has indicated the continuous

significance of water in transmitting of infectious diseases in developed countries. Also these articles have explained that water related diseases were more significantly issue of public health in developing countries specially in Norway and Sudan⁽¹³⁾ prevalence of water related diseases mostly disturbed a lot of people and it became the major challenges of public health.⁽¹⁴⁾ Compylobacteriosis is one of the increasing problem of public health and a few case control studies were conducted related to it and detection of risk factors of food born diseases⁽¹⁵⁾ in this Article review discussed about detection of research academic evidences regarding prevalence mode, epidemiology, Diagnosis, mode of transmission, pathogenesis, treatment and prevention of Water related diseases. In one intervention research which are conducted in Canada by Payment et al indicated that 14-40% of gastrointestinal diseases were due to Tap water⁽¹⁶⁾ in the United kingdom detected that there was a strong relationship between diarrhea and water low pressure in a case contro study, that it indicated a risk factor for Cryptosporidiosis⁽¹⁷⁾ fecal organisms and human viruses which are cultivated mostly in soil and water immediately entered into drinking water pipes through external ways.⁽¹⁸⁾ The most significantly known pathogen that had role in prevalence of Water related diseases included Compylobacter and noro virus which were same to prevalence of water related diseases in other Noradic countries^(19, 20) in a survey between Microbiology Laboratories in Norway indicated that Giardia and Cryptosporidium parasites detected in Gasroenteritis Patient that who did not travel to abroad countries.⁽²⁰⁾

6. Conclusion

The Prevalence of Water related disease is a continuous and permanent in developing countries and also in developed countries with good infrastructures. in this research founded that different Microorganisms such as Bacteria, Virus and Parasite could transfer through Contaminated Water.

7. Recommendations

For prevention of Water related diseases we must pay attention to following measures:

- 1) Obtaining of much knowledge about incidence of water related diseases.
- 2) Ministry of citizen development and Kabul Municipality should regulate and arrange the water distribution system according to standard norms of the world.
- 3) Holding for control of water related diseases were so significant.

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