An Appraisal of Waterborne Diseases in Nigeria: Focus on Effective Management

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ABSTRACT

Countries throughout the world are concerned with the effects of unclean drinking water because water-borne diseases are a major cause of morbidity and mortality. Clean drinking water is important for overall health and plays a substantial role in infant and child health and survival. The World Health Organization estimated that globally, about 1.8 million people die from diarrheal diseases annually, many of which have been linked to diseases acquired from the consumption of contaminated waters and seafood. Persons with compromised immune systems, are especially vulnerable to water-borne infections, including those infections that are self-limiting and typically not threatening to healthy individuals. Throughout the less developed part of the world, the proportion of households that use unclean drinking water source has declined, but it is extremely unlikely that all households will have a clean drinking water source in the foreseeable future. This appraisal focuses on waterborne diseases, its classification and the various methods by which borne diseases can be prevented and control

Keywords: Waterborne disease, sanitation, household, health, clean water

INTRODUCTION

Nigeria is one of the countries in the world that has unsafe water supplies due to the uncoordinated efforts of various federal, state and local agencies. Given the low quality of drinking water in Nigeria, most Nigerians will usually contract a waterborne illness. Nevertheless, when pollutants find their way into drinking water sources and are not eliminated by water treatment processes, it can and does make people sick. This can be attributed to lack of sanitation system, pipe breaks, leaks, ground water contamination campgrounds where human and wildlife use same source of water. According to Depledge [1], inadequate sanitation facilities can lead to spread of diseases through rodents, flies, and other animals. Both the ground and surface water supplies can be contaminated. Waterborne diseases are very rampant especially in sub Saharan Africa due to lack of access to clean water and poor sanitation. In Nigeria, contaminations of drinking water with pathogens have also been reported in several towns [2]. Waterborne outbreaks of enteric disease have occurred either when public drinking water supplies were not adequately treated after contamination with surface water or when surface waters contaminated with enteric pathogens have been used for recreational purpose [3]. Today only 58% of Nigerians have access to safe water [19]. Thus, most households have to resort to drinking water from wells and streams especially in the rural and suburban communities. These water sources are largely untreated and might harbour waterborne and vector-borne diseases such as cholera, typhoid fever, diarrhoea, hepatitis and guinea worm [4]; [5]. In developing countries, particularly in Nigeria, the two main water problems man contends with are the quantity and quality of water [6] & [7]. In view of its occurrence and distribution pattern, water is not easily available to man in the desirable amount and quality. This is a problem experienced in most cities and towns in the developing nations not to mention their rural settings. These factors have led to the growing rate of

water borne diseases like typhoid fever and cholera experienced in this part of the world [8]. Waterborne diseases are caused by pathogenic micro organisms which are directly transmitted when contaminated fresh water is consumed. Contaminated fresh water, used in the preparation of food, and be the source of food borne diseases through consumption of the same micro organisms. Many rivers, streams and wells worldwide are affected by faecal contamination leading to increased health risks to persons exposed to the water, degradation of recreational and drinking water quality [9]. Pathogenic bacteria that may be associated with faecal contamination include pathogenic strains of Escherichia coli, Campylobacter, Salmonella species, Shigella species and Vibrio cholerae. In addition to these organisms causing human diseases, resistance to antibiotics has made treatment of the diseases they cause more difficult [10]. A report by Central Bank of Nigeria in 2003 showed that in 2004 fertility rate in Nigeria was 5.6% per annum.

Furthermore, the report estimated that the Nigerian population has a natural rate of increase of 3.0%. By implication in 2025, Nigerian population should be about 231.6 million. This high natural rate of increase will affect family size and indirectly affect household utility factor in relation to water demand. This implies that a household demand for piped connection would increase as family size increases. In addition, there are evidences that waterborne diseases that had been eradicated in many parts of the world are still common in Nigeria [11]. This is further established by the UNDP 2006 Human Development Index as reported by [12] that ranked Nigeria 159th among 177 countries assessed for availability of safe water. The same report also indicted the country as a bedfellow in a club of 30 nations with the poorest quality of life worldwide. Numerous cases of water borne disease have been documented in the country. For example, there are increasing evidences of fresh outbreak of cholera, diarrhoea, and other waterborne diseases. A survey by the Federal Ministry of Health (FMOH) showed outbreak of cholera in Katsina, Kaduna, Kano, Bornu, Plateau, Benue, Cross-river, Akwa-Ibom, Lagos and Delta States. Furthermore, in 1989, Nigeria recorded 1,059 cases of cholera with 60 deaths (5.7%); and within the same there were 65,588 cases of simple diarrhoea with 132 deaths (0.2%). Also within the same period, there were 2,911 cases of hepatitis with 21 deaths (0.7%), and typhoid and paratyphoid going to 4,280 cases with 49 deaths (1.1%) [13]. Studies have shown that the occurrence of waterborne diseases in cities of developing countries has been due to unsafe water, inadequate sanitation and poor hygiene among human population. For example, [14] examines the relationship between the spatial patterns of waterborne disease and water quality in parts of Ibadan, Nigeria in which he concluded that provision of adequate portable water remains the most important tool for preventing water borne diseases in the city. This situation is not peculiar to only the big cities in Nigeria as the Vanguard newspapers on the 25th of August, 2011 reported that at least one person was confirmed dead and 20 hospitalized in different hospitals due to the devastating effect of water borne diseases in Ile-Ife, Nigeria. However, there is little documentation about water borne diseases in Ile-Ife which perhaps perpetuates the inadequate awareness of their occurrences and incidence factors let alone the spatial-temporal trend. In view of the above, this study attempts to review water borne diseases and effective ways to manage it in Nigeria

Classification of Waterborne Diseases

Waterborne or water related diseases encompass illnesses resulting from both direct and indirect exposure to water, whether by consumption or by skin

exposure during bathing or recreational water use. It includes disease due to water-associated pathogens and toxic substances. A broader definition includes illness related to water shortage or water contamination during adverse climate events, such as floods and droughts, and diseases related to vectors with part of their life cycle in water habitats [15]. Basically, waterborne diseases can be transmitted through four main routes: Water-borne route, Water-washed route, Water-based route and Insect vector route or water related route.

Water-Borne Diseases

Waterborne diseases are those diseases that are transmitted through the direct drinking of water contaminated with pathogenic microorganisms. Contaminated drinking water when used in the preparation of food can be the source of food borne disease through consumption of the same microorganisms. Most waterborne diseases are characterized by diarrhoea, which involves excessive stooling, often resulting to dehydration and possibly death. According to the World Health Organization, diarrheal disease accounts for an estimated 4.1% of the total daily global burden of disease and is responsible for the deaths of 1.8 million people every year. Further estimates suggest that 88% of that burden is attributable to unsafe water supply, sanitation and hygiene and is mostly concentrated on children in developing countries [16]. Most waterborne diseases are often transmitted via the fecal-oral route, and this occurs when human faecal material is ingested through drinking contaminated water or eating contaminated food which mainly arises from poor sewage management and improper sanitation. Faecal pollution of drinking-water may be sporadic and the degree of faecal contamination maybe low or fluctuate widely. However, where contamination levels are high, consumers (especially the visitors, the very young, the old and those suffering from immunodeficiency-related diseases) may be at a significant risk of infection. In rural African regions, faecal contamination of water arises from runoffs from nearby bushes and forest which serve as defecation sites for rural dwellers. Waterborne disease can be caused by protozoa, viruses, bacteria, and intestinal parasites. Some of the organisms remarkable for their role in the outbreak of waterborne disease include Cholera, Amoebic dysentery, Bacillary dysentery (shigellosis), Cryptosporidiosis, Typhoid, Giardiasis, Paratyphoid, Balantidiasis, Salmonellosis, Campylobacter enteritis, Rotavirus diarrhoea, E. coli diarrhea, Hepatitis A, Leptospirosis and Poliomyelitis [17].

Water-Washed Diseases

Water washed or water scarce diseases are those diseases which thrive in conditions with freshwater scarcity and poor sanitation. Control of water-washed diseases depends more on the quantity of water than the quality [18]. Examples of water washed diseases includes; Scabies, Typhus, Yaws, Relapsing fever, Impetigo, Trachoma, Conjunctivitis and Skin ulcers. Four types of water-washed diseases are considered here: soil-transmitted helminthes, acute respiratory infections (ARI), skin and eye diseases, and diseases caused by fleas, lice, mites or ticks. For all of these, washing and improved personal hygiene play an important role in preventing disease transmission [18].

Soil-Transmitted Helminths

Helminths are intestinal worms (nematodes) that are transmitted primarily through contact with contaminated soil. The most prevalent helminths are ascaris (Ascaris lumbricoides), hookworm (Ancylostoma duodenale and Necator americanus) and whipworm (Trichuris trichiura). Together, these 'geohelminths' currently infect about one-quarter to one-third of the world's population [18, 19]. Over 130 million children suffer from high intensity geohelminthic infections; helminths cause about

12,000 deaths each year [2]. These diseases can be considered water washed. Improved hygiene and sanitation can reduce their incidence.

Mass deworming of children is also recognized as an effective control measure [2].

Acute Respiratory Infections

Acute respiratory infections (ARI) including pneumonia are responsible for approximately 19% of total child deaths every year [18]. Evidence demonstrating that good hygiene practices, especially hand-washing with soap, can significantly reduce the transmission of ARI abounds. In view of the link between ARI and hygiene, it can now be considered a water-washed disease [19].

Skin and Eye Diseases

United Nations Children's Fund 2008 posits that trachoma is the world's leading cause of preventable blindness. About 6 million people are blind due to trachoma and more than 10% of the world's population is at risk. Globally, the disease results in an estimated $2.9 billion in lost productivity each year (International Trachoma Initiative; 2003) in the US, trachoma is caused by the Chlamydia trachomatis bacteria which inflame the eye. After years of repeated infections, the inside of the eyelids may be scarred so severely that the eyelid turns inwards with eyelashes rubbing on the eyeball. Flies are implicated in the transmission of trachoma, and are often seen feeding on the discharge from infected eyes. The best control method for trachoma and conjunctivitis is improved access to water for face washing. Ringworm (tinea) is also water washed disease prevalent among children of school age and the aged. This infectious disease affects the skin, scalp and keratinized tissues and is caused by a fungus [18,19].

Water-Based Diseases

Water-based diseases are infections caused by parasitic pathogens found in aquatic host organisms. These host organisms includes; snail, fish, or other aquatic animal. Humans become infected by ingesting the infective forms or through skin penetration. Examples of water based diseases includes Schistosomiasis (cercariae released from snail, penetrate skin), Dracunculiasis (larvae ingested in crustacean), Paragonimiasis (metacercariae ingested in crab or crayfish) and Clonorchiasis (metacercariae ingested in fish). These diseases can be prevented through voiding contact with contaminated water, or use of protective clothing or barrier creams.

Insect Vector-Based Diseases or Water Related Diseases

These diseases are not directly related to drinking water quality. They are those diseases that are caused by insect vectors which breed in or around water bodies. Humans become infected by being bitten by these insect vectors. However, consideration of vector control during the design, construction and operation of surface water reservoirs and canals (for drinking water or irrigation purposes) can reduce the potential for water related disease transmission. Prevalence of water related diseases are high in tropical Africa as a result of poor environmental management and sanitation. Drainages are often waterlogged, hence constituting breeding sites for these insect vectors. Malaria is one of the water related diseases endemic in 117 countries with about 3.2 billion people living in risk areas all over the world [16]. The report further stated that there are about 350 to 500 million clinical cases of malaria worldwide each year with over 1 million deaths. About 59% of all clinical cases occur in Africa, 38% in Asia, and 3% in the Americas. The most common vector insects are mosquitoes and flies. Mosquito-borne diseases include malaria, yellow fever, Dengue fever, and filariasis. Fly-borne diseases are: Onchocerciasis (River-blindness) and Loiasis.

Effective Management of Waterborne Diseases

i. **Improved Water Source:** this constitute water sources that adequately protect water from outside contamination, such as piped water, tube wells, protected springs, and rainwater, etc. The use of an improved water source is a predicted protective factor because protection from outside contamination is a barrier to fecal-oral contamination.

ii. **Water Treatment:** Water treatment is considered an effective measure taken to make water safer to drink. The methods include boiling, filtering, or treating with chlorine. Water treatment is a protective factor because interventions are intended to remove or inactivate bacteria introduced through fecal-oral contamination.

iii. **Water Management**: Water management includes practices related to water transport and storage. Safe water transport and storage prevent contamination of water through the use of protected containers, such as covered buckets and jerricans that provide barriers to fecal-oral contamination.

iv. **General Sanitation:** here, sanitation practices are tailored toward household management of feces and are classified into four categories: household toilet availability/use, safe waste management, unsafe waste management, and open defecation. Household toilet availability/use is considered a predicted protective factor because it should provide a barrier against fecal-oral transmission. Although, most household toilets lack good structures proper management, this facility is considered protective. Safe waste management is also considered a predicted protective factor because it separates feces from the environment and humans.

CONCLUSION

The incidence of waterborne diseases is as a result of inability to gain access to portable drinking water most especially people living in the rural areas of the country. People search for drinking water from all sorts of unsafe water sources, which expose them to all kinds of dangers related to drinking of unsafe water. Based on the problems facing Nigeria, it is strongly recommended that ministries of water resources and environment at both state and federal levels take necessary steps by organizing sensitization programmes addressing the issue of waterborne disease, working closely with world health organization (WHO) and other health organizations to provide direct support to Nigerian government.

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