

# Role of Sanitation in Health Promotion

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**Abstract**—This paper deals with role of sanitation in health promotion. It outlines the role of biological pollutants viruses, bacteria, protozoa and helminths in spread of various communicable diseases among the human beings. This paper makes a special note on role of sanitation and hygiene promotion towards preventing communicable diseases. This paper sheds lights on impact of poor sanitation on vulnerable population. This paper concludes with some interesting findings along with policy suggestions.

## 1. INTRODUCTION

Increasing sanitation in developing countries is a key aspect in controlling waterborne diseases transmitted through faeces. As per the report by WHO (2004) pathogens cause diseases that are rapidly manifested, in particular affecting children and the elderly, and sometimes even resulting in fatalities diarrheal diseases are responsible for 1.8 million deaths every year. In contrast, safe excreta management can have positive effects when it is used as a fertilizer for agriculture. However, for this, it is necessary first to treat faecal sludge to reduce its pathogen content to levels that do not represent a risk. This requires finding low cost, efficient and robust treatment methods that, under the precarious conditions of low income regions, are capable of producing reliable results.

## 2. BIOLOGICAL POLLUTANTS

According to Jiménez (2009) there are four groups of organisms that can be found in faecal sludge: viruses, bacteria, protozoa and helminths. The content and variety of pathogens found in low income areas will be considerably higher than that found in high income ones, as a result of the lower level of health conditions.

## 3. VIRUSES

Viruses are the smallest (0.01 to 0.3  $\mu\text{m}$ ) infectious agents. They are obligate intracellular parasites that only multiply once inside the infected host cell which they also use to reproduce. They occur in different shapes and consist of nucleic acid (DNA or RNA) surrounded by a protein layer and sometimes a lipid membrane. There are more than 150 types of enteric viruses capable of producing infections that multiply in the intestine and are expelled in faeces. Unlike bacteria, pathogenic viruses are found in faeces of infected people, independently of whether they display symptoms. The

composition, type and, especially, the content of viruses contained in faecal excreta is poorly known, particularly in developing countries, as result of the complex and costly analytical techniques required to identify them.

The enteric viruses most relevant to man are enteroviruses, rotaviruses, reoviruses, caliciviruses, adenoviruses and hepatitis A viruses. Rotaviruses are the main cause of infant gastroenteritis worldwide. As per the report by Jiménez (2003) they are responsible for between 0.5 and 1 billion cases of diarrhoea per year in children under five years of age in Africa, Asia and Latin America and up to 3.5 million deaths. It is recognized that low virus levels may cause infection or illness; some viruses contained in faeces are much more resistant to chlorine disinfection than bacteria.

## 4. BACTERIA

Bacteria are single celled microorganisms ranging in size from 0.2-10  $\mu\text{m}$ . They reproduce and grow in an appropriate environment at defined ranges of temperature, salinity, pH, etc. The environmental distribution of bacteria is ubiquitous. Many species of bacteria are not harmful to man. In fact, some even live inside humans forming intestinal colonies. Bacteria are expelled in faeces at high concentrations more than  $10^{12}$  g-l. In faecal sludge, pathogenic bacteria are always present, but at a variable concentrations, depending on the local health conditions. Due to the high rate of endemic diseases they cause in developing countries, *Salmonella*, *Shigella* and *Helicobacter pylori* are of importance. In contrast, *Vibrio cholerae* is only present when an epidemic exists.

*Salmonella* species are almost always present in faecal sludge. A sick individual can expel up to 109 *Salmonella* /g of faeces. There are a wide variety of strains capable of infecting humans and animals. The incidence in humans is lower than in animals and has a seasonal variation. The most severe form of salmonellosis is typhoid fever caused by *Salmonella typhi*. Typical symptoms are chronic gastroenteritis with diarrhoea, stomach cramps, fever, nausea, vomiting and headache. In severe cases, collapse and death may occur. Transmission occurs through polluted water or food.

*Shigella* spp. occurs less frequently and live for a shorter period in the environment than *Salmonella* spp. *Shigella* rarely infects animals. A common route of transmission is through

swimming in polluted water, and also through the ingestion of polluted food or water. It produces bacillary dysentery or shigellosis, light watery diarrhoea that can develop into full-blown dysentery. The symptoms are fever, nausea, vomiting, abdominal pain, migraine and myalgia. The classic form of dysentery is characterized by the expulsion of faeces containing blood with or without mucus. The infective dose is less than 10<sup>3</sup> microorganisms. *Helicobacter pylori* is also common in faeces. The major habitat of *H. pylori* is the human gastric mucosa. *H. pylori* has a worldwide distribution, and it is transmitted by the faecal-oral or the oral-oral route and possibly also through the consumption of contaminated vegetables and water. In developing countries, the organisms are acquired early in childhood, and up to 90% of children are infected by the age of 5. As per the report by Thomas et al., (1992), this contrasts with the low infection rate during childhood observed in developed countries. The higher incidence of *Helicobacter* is in poorer, lower socioeconomic groups, for which crowding and poor sanitation have been identified as risk factor. *H. pylori* is the cause of gastric ulcers and stomach cancers. *Vibrio cholerae* causes a gastroenteritis referred to as cholera. The symptoms are a copious liquid diarrhoea and severe dehydration associated with vomiting. *Vibrio cholerae* is rare in developed countries but common in poor ones. Humans are the only known hosts and the most frequent vehicle for transmission is water, either through direct consumption or when used to irrigate produce that is consumed uncooked. Fish cultured in polluted water are another source of transmission.

## 5. PROTOZOA

Protozoa are the group of parasites most closely associated with diarrhoea. They are single celled organisms between 2 and 60 µm in size. They develop in two ways: as trophozoites and as cysts. Infection occurs when mature cysts are consumed. Cysts are resistant to gastric juices and transform themselves into trophozoites in the small intestine, lodging in the wall where they feed on bacteria and dead cells. In time, trophozoites become cysts, once again, and are expelled in faeces. Infected persons may or may not exhibit the disease's symptoms. Protozoa do not reproduce in the environment, only in their host. However, they are able to survive in the environment and remain active for periods ranging from some months to up to several years, depending on the environmental conditions. Most intestinal protozoa are transmitted through polluted water and food. The protozoa most frequently linked to aquatic diseases are *Entamoeba histolytica*, *Giardia lamblia* and *Cryptosporidium* spp. *Entamoeba histolytica* is one of the most significant parasites detected in faeces and is commonly known as Amoeba. It is single celled. Trophozoites are 20 to 40 µm in size, while the cysts measure between 10 and 16 µm. They usually lodge in the large intestine; occasionally they penetrate the intestinal wall, travelling and lodging in other organs. They are the cause of amoebic and hepatic dysentery. *Entamoeba histolytica* is present in 10% of the world's

population resulting in approximately 500 million infected persons. There are between 40 and 50 million cases of invasive amebiasis per year resulting in up to 100 000 annual deaths. As per the report by WHO (1997) placing it second after malaria in mortality caused by protozoan parasites. 96% of these cases occur in poor countries, especially on the Indian subcontinent, West Africa, the Far East and Central America.

*Giardia lamblia* cause diseases which are frequently endemic. Cysts can survive in water bodies for long periods, especially in winter. *Giardia* lives in the intestines of a large number of animals as trophozoites. It is the most common parasite of humans but food rather than water is the main pathway of transmission. The disease is characterized by extremely liquid, odourous and explosive diarrhoea, stomach and intestinal gases, nausea and loss of appetite.

*Cryptosporidium* spp. are protozoa, widespread in nature. Oocysts are resistant to chlorine and due to their small size (4-7 µm) are difficult to remove from water. They infect a wide range of farm animals and pets and were recently recognized as human pathogens. For this reason they are considered to be emerging pathogens. *Cryptosporidium* species are capable of completing a life cycle within the same host and causing reinfection. Once an individual has been infected, he carries the parasite for life. The disease rate in developing countries has been poorly studied, in particular due to the higher occurrence of other types of diseases.

Cryptosporidiosis is a concern for developed countries. Outbreaks have been reported in England, USA and Japan, linked to the pollution of water sources even when disinfected with chlorine. As per the report by Snelling et al., (2007) cryptosporidiosis in developing countries has shown a greater incidence among immune depressed people and in rural areas. The main symptoms of cryptosporidiosis are stomach cramps, nausea, dehydration and headaches.

## 6. HELMINTHS

It is known from the work of Jiménez (2009) that some helminths (worms) are parasites to humans. Helminths are pluri-cellular animal that occur in different types and sizes from 1 mm to several m in length, and have diverse and very complex life cycles compared to most of the known microorganisms in the sanitary field. The infective agents of helminthiasis are the eggs, not the worms. According to WHO (2006) helminth eggs are transmitted through: (a) the ingestion of crops polluted with wastewater, excreta or sludge, (b) direct contact with polluted sludge or faecal material, and (c) the ingestion of polluted meat. Helminthiasis have a high mortality rate in developing countries compared to developed ones. Globally, there is around 1-2 thousand million people infected but most of these are people from developing countries. The incidence rate may reach up to 90% where poverty and poor sanitary conditions prevail.

There are several kinds of helminthiasis with different local names; technically, helminthiasis takes their name from their causative agent. For instance trichuriasis is named after *Trichuris*. Ascariasis is the most common of the helminthiasis and is endemic in Africa, Latin America and the Far East. As per the report by Silva et al., 1997 and Jiménez (2009), most of the people infected are children under 15 years of age with problems of faltering growth and decreased physical fitness. Around 1.5 million of these children will probably never bridge the growth deficit, even if treated. It is improper to use the terms nematodes, *Ascaris* and helminths as synonyms. *Ascaris* is only one example of a nematode that is a pathogen. Other helminths may be pathogens although they are not nematodes.

## **7. SANITATION AND HYGIENE PREVENT THE SPREAD OF DISEASES**

Improving the disposal of human excreta can reduce illness due to diarrhoea by 34 percent. When combined with hand washing this impact can be doubled. Such improvements save children's lives and improve the quality of their health, growth and development. In addition to lowering the rates of diarrhoea, improved excreta disposal and hand washing reduces parasitic infections, worm infestations and trachoma. Worms affect an estimated 400 million school-aged children in the developing world. Infestation with parasitic worms is a major health problem and children in countries which have low sanitation coverage commonly carry up to 1,000 hookworms, roundworms and whipworms at a time, which can cause anaemia and other debilitating conditions. Worldwide, soil-transmitted helminths infect more than one billion people due to a lack of adequate sanitation. Chronic hookworm infestations are associated with reduced physical growth and impaired intellectual development, and children suffering from intense infestations with whipworm miss twice as many school days as kids who are not infested. One hundred percent of roundworm, whipworm or hookworm cases are related to poor water, sanitation and hygiene. Polio is another fecal-oral disease, for centuries the only line of defense.

## **8. A LETHAL DOSE**

Just one gram of faeces can contain more than 10 million viruses, 1 million bacteria, 1,000 parasite cysts and 100 parasite eggs and with more than 200 million tonnes of human waste going uncontained and untreated around the world each year the health of everyone is at risk. One of the reasons for this enormous risk is caused by the transfer of human excreta to the mouth. Pathogens in faeces can be transmitted in many ways: by hands, food, water, soil, animals, flies, etc. Proper sanitation and improved hygiene can build barriers to prevent the spread of these diseases. Improved sanitation is vital to health for a number of reasons. Open defecation and inadequate sanitation creates a source from which

communicable diseases can spread, placing society as whole at risk.

## **9. DISEASES ASSOCIATED WITH POOR SANITATION**

Diarrhoea is the second biggest killer of children under five in the world, despite intensive international efforts to reduce the number of deaths. Oral rehydration therapy (ORT) has more than halved the global toll of acute watery diarrhoea in the last 20 years. The remaining deaths are increasingly due to persistent and bloody diarrhoeas, which do not respond to ORT. For these, the best cure is prevention – through better hygiene and sanitation. Control of cholera is a major problem in several Asian countries as well as in Africa. From 2004 to 2008, over 830 000 cases were notified representing a 24% increase in the number of cases reported for this most recent five-year period. Proper personal and food hygiene coupled with hygienic disposal of human excreta are effective interventions to prevent the spread of cholera.

Intestinal worms have an enormous impact on children's ability to learn. Worms are spread when children inadvertently ingest human faeces or food contaminated with faeces. This happens mainly when proper toilet and hand washing facilities are lacking. The positive effects on school attendance and achievement of providing such facilities have been proven. Trachoma occurs worldwide and most often in poor rural communities in developing countries. Around six million people worldwide are blind due to trachoma and more than 150 million people are in need of treatment. Simple prevention measures include improving sanitation and encouraging children to wash their face with clean water.

## **10. EFFECTS OF SANITATION**

Where improved sanitation is provided along with better hygiene behaviours, real health benefits follow. Lower mortality or death due to diarrhoea -34% reduction through improved sanitation, which could be doubled if accompanied by hand washing with soap. Better nutrition, reduced stunting and increased heights among children due to reduction in diarrhoeal disease and a condition called tropical enteropathy. Improved learning and retention among school children due to reduction in worms and other sanitation related diseases.

Access to sanitation and water is a human right constitutes an important step towards making it a reality for everyone. It means that: Access to basic sanitation and safe water is an entitlement, rather than a commodity or a service provided on a charitable basis; Achieving basic and improved levels of sanitation and water supply services should be accelerated; The least served are better targeted, and thus inequalities should be reduced; Communities and vulnerable groups will be empowered to take part in decision-making processes; the means and mechanisms available within the United Nations human rights system will be used to monitor

the progress that nations make towards realizing the right to water and sanitation and to hold governments accountable.

### 11. WOMEN AND GIRLS

While having a toilet is important for everyone, access to safe, clean toilets brings particular benefits to women and girls. Freed from the need to defecate in the open, they no longer have to suffer the indignity of physical and verbal abuse or humiliation when relieving themselves. Sexual harassment and rape are also a risk for many women who wait until nightfall and seek the privacy of darkness to relieve themselves. Women and girls don't need toilet facilities just for defecation; they also need privacy and dignity when menstruating. The symptoms of menstruation, pregnancy and the postnatal period become more problematic if women have nowhere to deal with them adequately. Separate toilets at school mean more girls are likely to attend in the first place, and more girls are likely to stay on after puberty to complete their education. Women place a higher value on access to private sanitation facilities than men but often remain unheard. There is a real need for facilities which meet women's physical and psychological demands and preferences, and these can be readily achieved by including women in the design and placement of these facilities.

### 12. DISABLED, ELDERLY AND SICK

Some of the poorest and most marginalized people in the world are those with physical disabilities, the elderly, and those with HIV/AIDS or long term illnesses; but these people are also the ones whose needs are often overlooked. Not only do disabled people face social hurdles in the form of prejudice, pity or stigma from other members of the community, but, unable to negotiate obstacles in the natural environment, their social isolation can be mirrored by physical isolation. Access to improved sanitation is vital in order to ensure the dignity, safety and equality of this group of people and enhance their social inclusion. Additionally, sanitation can also play an important role in reducing the risks of opportunistic infections. It can greatly improve quality of life and make home based care for people living with HIV/AIDS easier and more dignified. Sanitation is one of the most inequitably distributed services, with the richest quintile of the global population four times more likely to use improved sanitation than the poor.

### 13. LACK OF ACCESS TO SANITATION

Access to safe drinking water and adequate sanitation, practice of hygienic behaviours such as handwashing, have key impacts on health and well-being. Lack of access results in poor health, with consequent economic and development impacts. On the other hand, poor access to sanitation is more likely for the poorest precisely because they are disadvantaged. Inadequate water, sanitation and hygiene keep women especially in poor health, out of education, in poverty and destined to bear and raise sickly children. The tangible benefits of having a toilet are easy to identify and measure – better health, higher levels of education, increased wealth and productivity for nations and individuals and a cleaner environment. Less tangible, but every bit as important, are the benefits in terms of privacy and human dignity.

### 14. CONCLUSION

It could be seen clearly from the above discussion that many pathogens promote the spread of communicable diseases due to poor sanitation and hygiene behavior of the people. The promotion of sanitation and hygiene is very essential to protect the human beings from the infection of various pathogens. Hence, there is a need to promote the hygiene and sanitation education in school curriculum and such types of education can be promoted through non formal education mode for the benefit of uneducated people

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