

# Health issue of the giardiasis waterborne illness



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## 1. Public Health Problem

From the wonderful outdoors to infected food and water, Giardia exists everywhere. Giardia is a parasitic protozoon that can cause giardiasis when it enters and infects the digestive tract. When one is exposed to Giardia through the means of exposure to contaminated food, water, or human contact, the parasite lodges itself into the small intestine and multiplies, which leads to the symptoms of giardiasis that include vomiting, bloating, nausea, diarrhea, and cramps, which are very common symptoms of waterborne illnesses. Although giardiasis is normally non-lethal, it can have significant effects on people, especially in children living in third-world countries, who already suffer from the effects of malnutrition. Symptoms of giardiasis, such as the passing of food and nutrition as vomit and diarrhea, make it difficult for the body to absorb fats and nutrients. Thus, it heightens the effect of malnutrition, which can stunt a child's mental and physical development.

Giardiasis exists within today's society as the Center for Disease Control and Prevention estimates that about 780 million people live their lives without having a clean water source, while 2.5 billion people live without proper sanitation [4]. This lack of clean water and sanitation is a method for Giardia to spread giardiasis since Giardia is able to be transmitted through contaminated soil, feces, and water. In fact, they also report that about 33% of third-world country's population are victims of this waterborne illness [2]. As a result, the EPA also estimates that about 200 million people contract giardiasis every year [3]. Giardia can exist in two different states in nature: trophozoite form and cyst form. When outside its host, the trophozoite form

is less infectious as the parasite is directly affected by its environment. However, giardia can also be expelled from the body in the form of a cyst, which is most commonly found when giardia is removed from the body in solid stool. Another reason for giardia's prominence in the cyst form is because in one day, one who is infected with giardiasis can excrete a range from one to ten billion of these giardia capsules. The cyst are thick walls that shelter two trophozoites from its surroundings until the cyst is able to be ingested by another host. With these thick walls, not only is the cyst more resistant to the environmental factors outside its former host, but it also allows Giardia to resist common water treatments like the addition of chlorine to water. Depending on the parasite's environment, it can live without a host from a range of four days to three months [2].

Hotspots for giardiasis are in nature and developing countries, recreational pools, and childcare settings. These places expose people to the risk factors of giardiasis since the common denominator amongst these places lack hygiene, sanitation, or properly treated water supplies. As a result, the risk factors make etiological factors out of children, people without access to safe and clean water, and people who have unprotected anal sex. These people are considered etiological factors as they can be found in Giardia hotspots, which puts them at higher risks of being exposed to the risk factors associated with giardiasis.

## 2. How to Solve the Problem

Currently, there are no known medicinal preemptive measure that effectively prevents giardiasis. However, the best-known way to stop Giardia from

entering the body is through hygiene. A solution that can decrease the amount of cases of giardiasis is through education. Although the technique for washing hands is crucial, it becomes insignificant if there is not an understanding of why certain actions are taken when washing hands. If there is no understanding of the why, hand hygiene will not be seen to be as important as it really is. In a study about the causal learning of children, it was found that children were able to take information about cause and effect mechanisms and make an informed choice based on their knowledge [6]. By emphasizing what is being done and prevented by the action of hand washing, it will reveal the significance and difference that clean hygiene can make. However, proper hygiene does not only extend to just proper hand-washing. Education about reliable water sources is also important as educating the public about the risks can prevent giardiasis. By reducing human behaviors like drinking contaminated river or lake water or drinking pool water, the parasite will not be ingested. Lastly, a common mode of prevention is education about safe sex. Since feces is a form of transportation, anal sex can put people at risk of giardiasis. Yet, this risk can be mitigated as contraceptives like condoms can be used to create a barrier to stop direct contact between feces and skin.

Another strategy to prevent the spread of giardiasis is through the installation of low-cost water filtration and sterilization systems in developing countries. Engineers have thought of several methods such as the ceramic filter, slow sand filter, and even a solar sterilization device that uses the ultraviolet radiation from the sun to kill germs in drinking water [5]. Although the low-cost systems will help reduce the infection of giardiasis by removing

and killing some of the microorganisms, it is still a low-cost water system and it would not be as effective as the systems seen in industrialized countries.

Giardiasis is a problem that has been prominent within developing countries. As a result, more ancient cultures have concocted remedies to fight giardiasis infections. According to an ethnopharmacology study conducted by Timothy Johns and associates, the Luo would use the leaves, roots, barks or a combination of two ingredients to make methanolic extracts remedy the gastrointestinal symptoms of the infection. Out of the 36 different extracts used to counter gastrointestinal problems, 21 of the remedies were able to kill or at least, impede the growth of *Giardia* when tested in a test tube. However, for some of the remedies, their effectiveness was correlated with their concentration. At lower concentrations, instead of being lethal, some of the concoctions were only able to retard the growth of the *Giardia* [1].

Even though industrialized countries have effective water filtration and sanitation systems, they are still prone to *Giardia* outbreaks. According to a report by the US National Library of Medicine National Institutes of Health, this was apparent in Bergen, Norway in the fall of 2004. There was a sewage leak near a lake, which was also the water supply for 42, 000 people in Bergen. Initially, the leakage did not have any effect on the lake, but during a period of heavy rainfall, the runoff led the contaminants into the lake. As a result, Bergen faced a giardiasis outbreak. Some secondary interventions that took place were hospitalized inhabitants were treated with metronidazole to flush the parasites out of their digestive tract. Then, a notice was posted for the citizens to boil all water before consumption to kill the microorganisms living within their water supply. In the meantime, a new

water plant equipped with a better filtration system and a UV disinfection system was being built to replace the old plant [9].

### 3. Public Health in the Future

In a study conducted in Manila, Philippines, the genotype of different types of *Giardia* were sequenced. Stool samples from feces around the city were collected and two groups were identified. The study contrasted the qualities between the two groups. The first group seemed to be a more prominent type of *Giardia* around the world, while the second group seemed to originate from domesticated animals like dogs and could also be found more frequently in childcare facilities. Although the observations found by the study are seemingly random, the hope behind the study is to find correlations between genotype and the different ways different types of *Giardia* spread. By discovering this correlation, they believe that they can be able to better manage and stop giardiasis infections [10].

However, because research regarding *Giardia* is still in progress, the best preventative method of avoiding giardiasis infections is by following clean hygiene, being wary of the reliability of the water source, and avoiding contact with feces while having sexual intercourse [2]. Although there is no vaccine or immunity to giardiasis, following these three pieces of advice can greatly reduce one's exposure to the risk factors.

In my opinion, the first step to stopping the prominence of giardiasis is through education. However, it is not just education for those in industrialized countries, which already have clean water, but rather we should shift our focuses to developing countries. By teaching those in

developing countries skills such as boiling water or building a sand filtration system, they can become less dependent on the help from first world countries and become more self-reliant on their own skills. Moreover, those who learn the skill can teach others and pass on the skill to others who do not have access to clean water.

While educating people from developing countries on how to manually clean their own water, the next step to take is researching a cheaper and effective water filtration system that can be installed in multiple developing countries. Many cases of giardiasis originate from third-world countries; so, by eliminating Giardia in the places with the most cases, the disease's prominence can be heavily reduced. In addition, I think that more money should be poured into research on a more cost-effective water purifying system because it can also benefit other public health disciplines since fresh, clean water is becoming scarcer as a resource. The ability to cheaply and efficiently clean water has the utmost importance as fresh and clean water is a necessity to support life on earth.

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