



Worm infestations in children

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Introduction

While intestinal worm infestations occur worldwide, some kinds occur more commonly in warm, moist tropical or subtropical areas where sanitation is inadequate. Children are most affected by these diseases, but anyone can become infected. Nematodes (roundworms) are usually transmitted by contact with infected soil. Cestodes such as tapeworms are transmitted by eating undercooked meat from infected animals, and trematodes, such as bilharzia, are transmitted by skin penetration in contaminated fresh water such as rivers.

Nematodes (Roundworms)

Roundworms are non-segmented worms (helminths) with elongate cylindrical bodies. Many roundworms infect humans. However, six species spend the majority of their lifecycle within the bowel and are classified as intestinal nematodes. These include: *Ascaris lumbricoides* (large roundworm); *Trichuris trichiura* (whipworm); *Ancylostoma duodenale* and *Necator americanus* (the two human hookworms); *Enterobius vermicularis* (pinworm); and *Strongyloides stercoralis* (threadworm). Of these helminths, Ascaris, whipworm, and hookworms are commonly grouped together as the soil-transmitted helminths (STHs) and are the main species that infect humans.

About soil-transmitted helminths (STHs)

Transmission

STHs live in the intestines of infected people where they produce thousands of eggs which are passed in the faeces. If sanitation is inadequate, eggs present in human faeces may

be passed into the soil and contaminate it. The eggs develop into infective stages, which may be transmitted to humans.

Causes

STH infections can be caused when ingesting infected eggs which are present in contaminated foods. This may occur when vegetables which have been grown in contaminated soil are not carefully cooked, washed or peeled. Ascariasis (large roundworm) occurs most frequently in children who play in soil contaminated with faeces. Hookworm infections are acquired primarily through penetration of infected larvae into the skin from infected soil.

Symptoms

STH infections may be asymptomatic. Heavier infections with **ascariasis** can cause malnutrition and impair intellectual development and growth of children. Intestinal obstruction and rectal prolapse can occur, which may require surgical intervention.

Children with severe **whipworm** infection may experience abdominal pain, rectal prolapse and anaemia.

The most important complications of **hookworm** disease are iron-deficiency anaemia and malnutrition, with anaemia being particularly detrimental to children and pregnant women.

Prevention

To help prevent infestation with STHs, it is important to teach children the importance of washing hands correctly with soap and running warm water, particularly after using the toilet and before eating. They should also avoid walking barefoot when outdoors. In many developing countries, it is important to ensure that faeces are disposed of properly.

About pinworms

While an infected person sleeps, female pinworms leave the intestine through the anus and deposit their eggs on the surrounding skin.

Pinworm infection may be transmitted when eggs are swallowed. Eggs are often introduced into the mouth from fingers, or they may be acquired from contaminated food. Children may re-infect themselves by transferring eggs from the area around their anus to their mouth. Most cases occur in school-going children, and family members or carers of an infected child.

Pinworm infections seldom cause serious clinical problems. However, severe itching around the anus is a common symptom. The itching can lead to insomnia and restlessness, and scratching can lead to secondary infection. Other symptoms may include nausea, vomiting, and abdominal pain.

Since pinworm infections are easily transmitted from person to person, attention should be paid to daily hygiene such as daily changing of underwear, proper cleansing of the perianal area, and protection of children against anal-finger-mouth transmission. Hands should be well washed with soap and water after using the toilet, and bedrooms should be regularly vacuumed as air-borne eggs can be ingested.

When treating pinworm, it is advised to treat all members of the family, and, since reinfection is very common, treatment may be repeated after two weeks.

About threadworms

Chronic threadworm infections are transmitted from contaminated soil, by larval penetration through the skin.

Threadworm infections are often asymptomatic or cause only mild symptoms. The most important complication is the possibility of a massive worm burden (hyperinfection) with severe symptoms in the lungs or digestive tract, or other organs such as the brain or liver. Hyperinfection is particularly dangerous in immunosuppressed children. To avoid this complication, everyone who acquires this infestation should be treated.

In managing the condition, attention should be given to anaemia and hyperproteinaemia when therapy is initiated. Conscientious hygiene after using the toilet, and wearing shoes, may help prevent the transmission of threadworm.

Oral treatment of nematode infection

The oral treatment of choice for intestinal nematodes, with the exception of threadworm, is albendazole or mebendazole.

Albendazole is registered for children over two years of age and requires a doctor's prescription. It is used for ascariasis, whipworm, hookworm, pinworm and threadworm.

Mebendazole is registered for children over one year, and is available over-the-counter (OTC). It is suitable for ascariasis, whipworm, hookworm and pinworm.

These two agents are available as tablet, chew tablet and suspension formulations.

Piperazine citrate, which is available OTC, may be used by children from under one year of age for ascariasis, especially if intestinal obstruction is present. It is used to treat pinworm

infestation in children from under two years of age. This agent is available in granule and syrup form.

Albendazole is used to treat threadworm. Ivermectin is the preferred agent for this treatment but is not registered in South Africa. It can be obtained on a named patient basis with South African Health Products Regulatory Authority (SAHPRA) approval and is used for children from five years of age up.

Cestodes (Tapeworms)

Tapeworms are flat, segmented worms which live in the intestines of some animals. Animals can become infected with these parasites when grazing in pastures or drinking contaminated water. Tapeworms are identified by the animal from which they come, and those which are found in the human intestine include *Taenia saginata* from beef, *Taenia solium* from pork, *Diphyllobothrium latum* from fish, and *Hymenolepiasis* which is known as the dwarf tapeworm.

Transmission

Tapeworms have a three-stage lifecycle: an egg, followed by an immature cyst-like larva called a cysticercus, which develops into an adult worm in the human intestine. The adult worm produces many more eggs, which may be passed with the stool.

Causes

The cysticerci can get into the muscles of their hosts and infect them. Eating undercooked pork or beef from an infected animal which contains viable cysticerci is the main cause of tapeworm infections in humans.

It is possible to contract pork tapeworms from foods prepared by an infected person. Food can be contaminated by a person who, after defaecating, does not wash hands well and then prepares food.

Symptoms

Infections are usually asymptomatic, and the worms may be discovered incidentally as segments in stools, clothing or bedding. Weakness, diarrhoea, abdominal pain, loss of appetite and weight loss may be present.

Infection with *T. solium* (pork tapeworm) can result in the cysticerci moving out of the intestine to other parts of the body such as the liver, eyes and brain where they may cause cysticercosis. This can be a life-threatening infection and treatment to eliminate adult tapeworms is recommended to prevent complications.

Treatment

Praziquantel and niclosamide are oral agents which are effective against pork, beef, fish and dwarf tapeworms. Praziquantel requires a doctor's prescription and is available in tablet form.

Niclosamide is available OTC as a chew tablet, and may be used by adults and children over the age of two years. It is also registered for children under the age of two years.

Albendazole and mebendazole are alternatives when treating pork and beef tapeworm.

Prevention

Meat should be thoroughly cooked, and the eating of raw fish or meat avoided. Always wash hands with soap and hot water before preparing food, and before and after using the toilet.

Trematodes (Schistosomiasis)

Schistosomiasis is caused by blood flukes (trematode worms) and is known as bilharzia. It is highly prevalent in the tropical and subtropical areas of southern Africa.

Transmission

The parasites that cause schistosomiasis live in certain types of freshwater snails. The larval forms of the parasite are infectious and are released by the snails into the water. People in contact with contaminated water become infected when the larvae penetrate the skin and develop into adult schistosomes which live in the blood vessels of the human body. The females release eggs which may be passed in the faeces or urine into fresh water thereby contaminating it.

Causes

In southern Africa, human infections are often caused by *Schistosoma mansoni* and *S. haematobium*. *S. mansoni* is associated with intestinal schistosomiasis, and *S. haematobium* with urogenital schistosomiasis.

Humans may become infected with schistosomiasis during routine agricultural, occupational and recreational activities, which expose them to contact with infested water.

Lack of hygiene and playing habits of school-aged children such as swimming or fishing in infested water make them particularly vulnerable to infection.

Symptoms

The classic sign of urogenital schistosomiasis is haematuria (blood in urine). Intestinal schistosomiasis can cause abdominal pain, diarrhoea and blood in the stool.

In children, schistosomiasis can cause anaemia, stunting of growth, and a reduced ability to learn.

Prevention and control

The economic and health effects of schistosomiasis are considerable and large-scale treatment projects of at-risk population groups have been initiated. These measures include access to safe water, improved sanitation, hygiene education, and snail control. School-aged children in endemic areas are targeted for large-scale treatment with praziquantel.

Treatment

Praziquantel is the recommended treatment against all forms of schistosomiasis, and should be initiated by a doctor. Even though re-infection may occur after treatment, the risk of developing severe disease is diminished and even reversed when treatment is initiated and repeated in childhood.

Conclusion

Worm infestations occur worldwide, particularly in poorer communities where sanitation is inadequate. They occur more often in children. Some worm infections can be treated orally with OTC agents, but if there are complications or if bilharzia is suspected, a doctor should be consulted.

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