



# HELMINTH INVASIONS IN CHILDREN: CAUSES, CLINICAL PICTURE, DIAGNOSIS, TREATMENT AND PREVENTION

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## ANNOTATION

*Helminthic infestations are widespread diseases caused by parasitic worms - helminths. Worldwide, more than 1.5 billion people, or 24% of the population, are infected with helminthic parasites. More than 870 million children live in areas with widespread helminths and need treatment and prevention of helminth infestations [1,2]. Helminthiasis is most diverse and widespread in regions with a hot and humid climate and a low socio-economic standard of living.*

**KEY WORDS:** *helminthic infestations, helminths, children, diagnosis, treatment, prevention*

## RELEVANCE

Helminthic infestations (helminthiasis) are widespread throughout the world. According to the World Health Organization (WHO), more than 25% of the world's population is infected with helminths. [1-10]. Over 350 species of helminths can infect the human body. Worldwide, more than 1.5 billion people, or 24% of the population, are infected with helminthic parasites [11-15]. More than 870 million children live in areas with widespread helminths and need treatment and prevention of helminth infestations [16-18].

About 65 species of helminths are registered in the CIS countries, of which 18-20 species are frequently encountered, which are of greatest medical importance due to their wide distribution and significant damage to public health. Helminthiasis is most diverse and widespread in regions with a hot and humid climate and a low socio-economic standard of living.

## REASONS FOR WORMS IN CHILDREN

The prevalence of cysts, eggs and intermediate forms of development of parasites in the child's environment and insufficient attention to hygienic procedures in children of preschool and school age are the main reasons for the wide spread of childhood helminthiasis.

The routes of invasion of different types of helminth infections are different:

1. Nematodes. Helminth eggs are released by the carrier during defecation and mature in the soil for 2-3 weeks, after which infection occurs through water and food that have had contact with soil contaminated with helminth eggs and cysts.
2. Ascariasis. A child swallows food or water contaminated with ascaris eggs, larvae develop from the eggs in the intestines, and then they migrate through the blood vessels of the liver and heart to the lungs to soon complete their development cycle, rising through the bronchi to the root of the tongue and being swallowed again. Roundworms often cause pathologies of the gastrointestinal tract (GIT) and lung diseases. The source of roundworm eggs can be stray dogs.
3. Enterobiasis. This form of pathology is transmitted through everyday contact of one infected person with another and therefore affects entire groups.
4. With cestodias and trematodes, infection occurs through contaminated water and insufficiently thermally processed food of animal origin.

The pathogenesis of childhood helminthiasis includes acute and chronic phases. The first stage lasts from 2 to 8 weeks from the moment of infection, the symptoms are easily confused with signs of an allergy. The chronic phase is characterized by microtraumas of tissues and internal organs resulting from the mechanical impact of parasites on them. This phase is accompanied by general intoxication of the body as a result of the accumulation of waste products of worms. It happens that helminthiasis in children is asymptomatic until concomitant disorders develop. The complicated course of the disease increases the risk of developing cancer pathologies in the child's body.

## CLINICAL PICTURE OF HELMINTH INFECTIONS IN CHILDREN

The acute phase of childhood helminthiasis is characterized by:

- cramping pain around the navel or without a specific localization, appearing regardless of food intake
- recurrent itchy rash affecting the skin;
- fever and chills;
- cramping pain around the navel or without a specific localization, appearing regardless of food intake



- soreness of the lymph nodes;
- joint pain;
- myalgia;
- shortness of breath and chest discomfort;
- stool disorders;
- flatulence;
- belching;
- nausea.

Manifestations of intoxication due to helminthiasis are:

- 1. loss of appetite,
  - 2. disturbance of night sleep (restlessness, sounds during sleep or frequent awakenings);
  - 3. grinding teeth;
  - 4. irritability, moodiness, aggressiveness.
- Toxic effects of parasites on the central nervous system may cause seizures.

In severe forms of helminthiasis, a child may develop pulmonary syndrome, which is characterized by a prolonged asthmatic-type cough. With trichinosis and trichocephalosis, tissue swelling occurs (swelling of the face, accompanied by the risk of developing Quincke's edema).

With ascariasis, the larvae from the gastrointestinal tract penetrate the blood vessels and from there spread to the internal organs, which can cause pleurisy and coughing up blood.

Toxocarosis is transmitted to humans from dogs and manifests itself in the form of allergic reactions (choking attacks, skin rash, etc.).

Helminths are also a powerful factor in sensitizing the body. Against the background of nematodes, atopic dermatitis intensifies and the course of other allergic diseases (including bronchial asthma, hay fever) worsens. Allergic reactions during helminthiasis occur torpidly and are almost resistant to traditional antiallergic therapy. Eosinophilia in a general blood test is both a sign of allergies and a sign of parasitic diseases, but with helminthiasis it does not occur very often (only 3-5% of cases). In some situations, helminths lead to a significant increase in the level of total IgE.

Helminths weaken the functioning of the immune system, as a result of which the child suffers from frequent respiratory diseases, he may develop pustular or fungal lesions of the skin and mucous membranes, caries. With helminth infections, the child often has inadequate reactions to preventive vaccinations.

Helminths cause intestinal dysbiosis, inhibiting normal intestinal microflora and weakening the local immunity of the gastrointestinal tract. Characteristic features of microbiocenosis during helminthic infestations are a decrease in the total amount of *E. coli* and an increase in the number of non-fermenting bacteria, a decrease in the number of lactobacilli, and an increase in coccal flora. Against the background of dysbacteriosis, functional disorders of the gastrointestinal tract and allergic pathology worsen, secondary (reactive) changes in the liver, biliary tract and pancreas develop.

Over time, the body is poisoned by waste products of worms. The patient's fatigue increases, his appetite worsens or, on the contrary, increases, and headaches appear. The functioning of the digestive tract is disrupted: abdominal pain, diarrhea, constipation, nausea or vomiting appear. The consequences can be very unpleasant - from skin rashes to bronchial asthma.

The most common types of helminthiasis are enterobiasis and ascariasis. With enterobiasis (caused by pinworms), intense itching occurs in the anus, intensifying at night. This occurs because pinworms lay eggs in the skin of the perianal area. At night, the itching in the anus and perineum is so severe that the child wakes up and cries. As a rule, such children sleep very restlessly and often grind their teeth at night. The child usually scratches the itchy areas, and helminth eggs get under the nails, on bedding and linen, and can spread throughout the apartment. This creates conditions for the child to re-infect himself and infect others.

In children with pinworms, appetite worsens, vomiting, nausea or drooling, and aversion to food appear, especially in the morning. Most complain of paroxysmal pain in the abdomen, often in the umbilical region. Unstable stools are noted. The child's mood also changes: he becomes capricious, unbalanced, and complains of fatigue and weakness. The level of hemoglobin in the blood often decreases.



With ascariasis (it is caused by roundworms), due to the migration characteristics of the parasite in the body, a paroxysmal severe cough may begin. Skin rashes often appear. Ascariasis when parasitized by a large number of helminths can be complicated by intestinal obstruction, obstructive jaundice, and pancreatitis.

In severe cases of helminthic disease, disorders of the nervous system develop: prolonged headaches and dizziness appear. Obsessive movements, so-called tics, may occur - blinking, sniffing, twitching shoulders, etc.

## DIAGNOSTICS

Blood tests and serological tests are informative for diagnosis. Traces of the activity of lower worms in the body of an infected child are present in all biological fluids and secretions (blood, feces, bile, sputum), as well as on the skin around the anus. Samples of these secretions and cells can be used as material for laboratory research. A mandatory appointment when diagnosing helminthiasis is a coprogram and scraping of cells from the perianal area. The diagnosis is obvious by direct detection of helminths in the stool. You can take a routine stool test for worm eggs at the sanitary-epidemiological station.

In diagnostics, hardware tests play an important role:

- radiographic images;
- Ultrasound;
- MRI and CT;
- endoscopic examination;
- taking a sample of epithelium and muscle;
- probing and analysis of the contents of the duodenum
- skin allergy tests.

These methods make it possible to assess the damage caused by parasites: they identify cysts of parenchymal tissues and the brain and determine the location of helminths.

## TREATMENT

In order to determine treatment tactics, it is important to clarify the type of helminth, the stage of the disease, the duration of the invasion, the presence or absence of concomitant diseases, especially gastroenterological ones. When treating helminthic infestations, albendazole and mebendazole demonstrate the greatest spectrum of action, therefore these two drugs are recommended by WHO for the treatment of almost all the most common helminthiasis [19-24]. Effective and safe therapy with anthelmintics requires strict adherence to doses and treatment regimens.

WHO recommends periodic anthelmintic treatment (deworming) without prior individual diagnosis among all at-risk people living in endemic areas. Treatment should be carried out once a year if the prevalence of soil-transmitted helminth infections exceeds 20%, and twice a year if this figure in the community exceeds 50%. Deworming is carried out with the drugs albendazole and mebendazole.

Targeted treatment of helminthic infestations in children is carried out with drugs that destroy helminths at different stages of their development. At the end of the course of therapy, a repeat cycle of tests is prescribed to confirm the effectiveness of treatment.

Therapeutic measures for infection with worms are very diverse; in any case, a set of procedures is needed to deworm the body of children. It is not always necessary to prescribe chemical medications, which are usually highly toxic. The therapeutic effect obtained from the use of biologically active complexes suggests that they are good assistants in the complex treatment of those infected with worms. Therefore, in programs for cleansing the body of worms and other parasites, both special anthelmintic drugs and natural biologically active complexes are prescribed.

The choice of antiparasitic drug is made taking into account the type of helminths, the phase of development of the pathology, and associated complications. Anthelmintic drugs that are effective against several types of pathogens are more often used. Thus, drugs from the benzimidazole group are prescribed for infection with roundworms, nematodes, trichinosis and trichocephalosis.

The key to successful deworming of a child is the simultaneous administration of anthelmintic therapy to the entire family or team. During treatment, it is necessary to maintain a hygienic regime to prevent re-infection.

To prevent allergies that occur due to helminthiasis, antihistamine drugs are used. If there are obvious signs of intoxication, symptomatic therapy is prescribed.

Thus, helminthic infestations are a fairly common and pressing problem in the clinical practice of doctors. In this review, we once again focused attention on modern approaches to the diagnosis, treatment and prevention of this pathology in children.



## FORECAST

With timely diagnosis and adequate treatment, the prognosis is favorable. To avoid relapses, it is necessary to follow preventive measures (personal hygiene rules, minimizing contact with unfamiliar animals, eating thoroughly washed vegetables and fruits).

## PREVENTION OF HELMINTISES IN CHILDREN

- Boiling water and heat treatment of products;
  - Use of personal hygiene products;
  - Washing kitchen utensils with detergents;
  - All family members must follow hygiene rules and try to avoid close contact of the child and his personal belongings with pets;
  - On the street it is important to ensure that the child does not pick up various objects; do not allow contact with animals;
  - It is important to instill in your child personal hygiene skills (wash hands with soap after going outside and going to the toilet);
  - It is advisable to periodically wet clean the house, wash toys with soap, especially if you have pets, as well as toys brought into the house from a walk; vacuum carpets, upholstered furniture and soft toys;
  - Do not give your child unwashed vegetables and fruits, insufficiently heat-treated meat and fish, raw water from natural reservoirs.
- A specific course of medications to prevent helminthic infestations should be carried out in the off-season twice a year with broad-spectrum drugs.

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