

**MEDICINE AND PHARMACEUTICAL SCIENCES**

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**Gulnar Bandalizada**

Scientific Research Institute of Medical Prevention  
named after V. Y. Akhundov  
gulnarbendelizade@gmail.com

**Gulnara Aliyeva**

Scientific Research Institute of Medical Prevention  
named after V. Y. Akhundov  
gulnarealiyeva555@gmail.com

**Yegana Abbasova**

Scientific Research Institute of Medical Prevention  
named after V. Y. Akhundov  
yegane.bagirova@inbox.ru

**Solmaz Aghayeva**

Scientific Research Institute of Medical Prevention  
named after V. Y. Akhundov  
solmazagayeva645@gmail.com

**Sakina Bakhshiyeva**

Scientific Research Institute of Medical Prevention  
named after V. Y. Akhundov  
sekinebaxsiyeva001@gmail.com

**Basic Principles of its Diagnosis and Prevention of Ascariidosis  
in the Modern Era****Abstract**

Human helminthiasis is one of the urgent problems of medical science and practical healthcare. More than 90 % of parasitic diseases in humans are caused by helminthiasis. Among helminths, soil-transmitted helminths are of particular importance due to their widespread distribution and the role they play in human pathologies.

*Ascaris lumbricoides* is the most widespread helminth among soil-transmitted helminths. Ascariasis is widespread in all countries, as well as in Azerbaijan, according to the WHO, about 15 % of the world's population is infected with it. WHO has prepared a program for the control and prevention of soil-transmitted helminths for 2016-2020, taking into account the negative impact of this ascariasis on human pathology, especially in children and their widespread distribution not only in developing countries, but also in developed European regions. One of the main goals of this program is to eliminate ascariasis among schoolchildren in the European region by 2020.

The Republic of Azerbaijan is one of the regions where soil-transmitted helminths is widespread. Many scientific-research works on various aspects of ascariasis have been carried out at the Scientific-Research Institute of Medical Parasitology and Tropical Medicine in Azerbaijan.

Ascariasis infection causes nervous system and cognitive impairment, mental and physical weakness and growth retardation in children. In adults, in most cases, irritability, reduced work capacity, and sleep disturbances occur.

Even if children and adults do not have any clinical symptoms, ascariasis causes weight loss and some infectious diseases (dysentery, typhoid fever, etc.). Ascariasis leads to complications of pregnancy and other pathological changes. Mechanical or parenchymal jaundice can be observed in 65 % of patients with ascariasis. Therefore, it is very important to study the current situation of the and to implement effective prevention and control measures against it.

**Keywords:** *helminthoses, soil-transmitted helminths, ascariasis, larvae, prevention*

## Introduction

Human helminthiasis is one of the urgent problems of medical science and practical healthcare. More than 90 % of parasitic diseases in humans are caused by helminthiasis.

Among helminths, soil-transmitted helminths are of particular importance due to their widespread distribution and the role they play in human pathologies. More than a quarter of the world's population is infected with soil-transmitted helminths. Humans are infected with soil-transmitted helminths mainly through external environmental factors (contaminated water, soil, vegetation, etc.).

Soil-transmitted helminths are found in developing countries with low sanitary-hygienic conditions in most countries of the world. On the other hand, since the development of the causative agent of soil-transmitted helminths is related to the external environment, they are mostly found in countries with tropical and subtropical climates.

*Ascaris lumbricoides* is the most widespread helminth among soil-transmitted helminths. Ascariasis is a widespread helminth in all countries, as well as in Azerbaijan. According to WHO, about 15 % of the world's population is infected with this helminth. Taking into account the negative impact of ascariasis on human pathology, especially in children, it has prepared a program for 2016-2020 on the control and prevention of soil-transmitted helminths in the countries of the European region. One of the main goals of this program is to eliminate ascariasis among schoolchildren in the European region by 2020 (VOZ, 2016-2020).

The Republic of Azerbaijan is one of the regions where soil-transmitted helminths is widespread. The study of these helminthoses on a scientific basis in the Republic began dynamically and intensively in 1931, after the establishment of the Scientific Research Institute of Medical Parasitology and Tropical Medicine in Azerbaijan. During these years, a lot of scientific and research work has been carried out on various aspects of the disease. As a result of these studies, the prevalence level, risk groups, epidemiological characteristics of ascariasis among the population in different regions and settlements were studied, efficient diagnostic methods, effective treatment schemes were developed, and some achievements were made in the fight against them. It should be noted that most of these research works were carried out 25-30 years ago.

Chobanov R. A. in his researches, it was shown that ascariasis was found on average in 22.1 % of the population in the republic until 1985. However, ascariasis is not evenly distributed in different regions, and according to the level of infection of this helminthosis, their foci are divided into 5 types. It is shown that ascariasis is 10 % in type I and II foci, 10-24.9 % in type III foci, 25-30.9 % in type IV foci, and more than 40 % in type V foci. Apparently, as part of the development of ascariasis takes place in the soil, their foci are divided into 3 groups according to contamination with helminth eggs:

- Type I slightly contaminated soil – with 11 ascariasis eggs in 1 kg of soil,
- Type II relatively contaminated – with 11 to 35 ascariasis eggs per 1 kg of soil,
- Type III heavily contaminated – soils with more than 35 ascariasis eggs per 1 kg of soil.

In the conducted studies, the authors show that 4-11 year-old children and housewives are mostly infected with these helminthoses (Chobanov, 1985, p. 46).

Examinations carried out on the Absheron peninsula, which is not favorable for ascariasis infection, revealed that  $9.73 \pm 0.7$  % of the population was infected with ascariasis on average. These examinations show that ascariasis infects mostly 4-11-year-old children (Salehov, Fatullayeva, 2018, p. 140-144; Salehov, Khanmirzayev, 2020, p. 89-94).

In most studies, one method was used during examinations. In some cases, the parasite does not secrete eggs, and in other cases, only the male species of the parasite is present in the intestines, in which case the correct result of the examination cannot be obtained. Therefore, the infection rates shown in these studies do not fully reflect the real situation.

In recent years, some researchers have studied the incidence of ascariasis in children, its migration and intestinal stage. Ascariasis was detected in  $21.0 \pm 1.1$  % of children. Here, ascariasis is the least common in children aged 1-3 years ( $13.6 \pm 2.3$  %), and the most common in children

aged 4-7 ( $24.5 \pm 2.1$  %) and 8-11 years old ( $25.8 \pm 2.1$  %) found in children. Apparently, ascariasis has been spreading among children at a high level in recent years (Ibrahimova, 2014, p. 21; Salehov, 2015, p. 207-210; Salehova, 2017, p. 21; Salehov, Ibrahimova, 2013, p. 94-95; Salehov, Ibrahimova, Salehova, 2013, p. 156-158).

Ascariasis infection peaks in pre-school and school-aged children and gradually decreases with age. Immunity occurs after infection with ascariasis, but this immunity does not prevent re-invasion. About 2,090 deaths are recorded worldwide as a result of ascariasis infection every year, with the highest percentage of deaths occurring in children aged 1-4 years. Although mortality is low compared to other infectious diseases, ascariasis causes disability, with disability peaking in children aged 5-9 years.

Ascariasis is not transmitted from person to person. The disease is transmitted to humans through fecal-oral route. Infection occurs when invasive eggs from contaminated soil fall into the human body (soil, water, greens, etc.). Invasion stage 3 larvae (L3) hatch, penetrate the intestinal mucosa and enter the bloodstream. Larvae are carried from the liver to the lungs by human blood. While in the lungs, the larvae grow significantly. Subsequently, the larvae reach the pulmonary airways, ascend the bronchotracheal tract, are swallowed, and fully developed L4 stage larvae enter the human small intestine, completing the migration cycle. Larvae turn into adult helminths up to 35 cm long in the intestine (Prevention, 2015). Adult helminths subsequently live in the intestine for 1-2 years. Although adult female helminths shed up to 400,000 eggs per day in human feces, the eggs must embryonate in moist, warm soil before they become infective to humans (Prevention, 2015). The presence of soil is essential for the completion of the life cycle, which is why the ascaris is called a soil-transmitted helminth (STH).

Ascariasis infection causes nervous system and cognitive impairment, mental and physical weakness and growth retardation in children. In adults, in most cases, irritability, reduced work capacity, and sleep disturbances occur. Even if children and adults do not have any clinical symptoms, ascariasis causes weight loss and some infectious diseases (dysentery, typhoid fever, etc.) Ascariasis leads to complications of pregnancy and other pathological changes. Mechanical or parenchymal jaundice can be observed in 65 % of patients with ascariasis.

In the migration phase of ascariasis, allergic symptoms are manifested in the body. During instrumental examinations, focal infiltrates are detected in the lungs, the amount of eosinophils in the blood increases and fluctuates between 15-30 %, in some cases this indicator is 60 % and more. In ascariasis, such a situation is called Löffler symptom complex.

In the intestinal phase of ascariasis, the clinical symptoms are different: usually these symptoms are weak, sometimes they are moderate, and in most cases, no symptoms are observed. In rare cases, the clinical symptoms are so severe that the patient's life is in danger and urgent treatment is required. This situation is more dangerous for children and can result in death. In the second phase, gastrointestinal or nervous system symptoms come to the fore in patients.

In the diagnosis of the first phase of ascariasis, IFA is also used from serological reactions.

Parasitological (coprological) examination methods are based on the finding of ascariasis eggs in feces.

Among these methods, the Fylborn method (enrichment method) is based on the principle of collecting eggs in the upper layer of the used liquid. When the patient's stool is examined by the Kato-Miuri method, the mixture proposed by the author is prepared in advance: 500 ml of glycerin + 500 ml of 6 % phenol solution + 6 ml of 3 % aqueous solution of malachite. Hydroscopic cellophane sheets cut into strips 20-30 mm thick with a thickness of 40-50  $\mu\text{m}$  are kept (soaked) in this mixture for 24 hours before use, and after being covered with faeces on the object glass, they are examined with a microscope. It should be noted that the Kato-Miura method is a simple, hygienic and effective method that is not inferior to other methods (Najafov, 2014, p. 134).

Reducing or eliminating ascariasis remains a global challenge. Application of preventive chemotherapy is carried out by regular and repeated administration of anthelmintic drugs to risk groups. The goal of these programs is to reduce infestation. Prophylactic chemotherapy is

administered once a year or two years to young children (12-23 months), preschool children (24-59 months), school-age children and women of reproductive age by giving anthelmintic drugs.

However, as a result of regular treatments, sometimes, the formation of resistance to these anthelmintic preparations is observed. Thus, in ascariasis, the occurrence of persistence in anthelmintic treatment has been determined. This factor can create additional obstacles in the fight against ascariasis.

Implementation of hygiene (WASH) programs can also be beneficial in controlling ascariasis. Observance of sanitation rules can significantly reduce Ascariasis infestation (Strunz et al., 2014). However, the effects of WASH programs are not immediate and require long-term financing (Vaz Nery et al., 2019). Although the implementation of WASH programs has been carried out on a global scale in recent years, it is not possible to achieve control and high results using these programs alone.

Ascariasis eggs are resistant to the environment (Jourdan et al., 2018). People living in endemic areas are repeatedly infected with ascariasis and can be re-infected usually 3 months after treatment. The response of the human body to ascariasis can be either inflammatory processes or immunomodulation. The destruction of larvae in the human body depends on the immune response.

From this point of view, it is very important to study the current situation of ascariasis and implement effective prevention and control measures against them.

### Conclusion

Ascariasis infection causes nervous system and cognitive impairment, mental and physical weakness and growth retardation in children. In adults, in most cases, irritability, reduced work ability, and sleep disturbances occur. Even if children and adults do not have any clinical symptoms, ascariasis causes weight loss and some infectious diseases (dysentery, typhoid fever, etc.). Ascariasis leads to complications of pregnancy and other pathological changes. Mechanical or parenchymal jaundice can be observed in 65 % of patients with ascariasis. Therefore, it is very important to study the current situation of the spread of ascariasis among the population and to implement effective control and preventive measures against it.

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