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## Worm infestation in Ayurveda and modern science: Approach and management

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### Abstract

The worm infection or helminthiasis is one of the most common problems in pediatrics practice especially in developing countries due to the poor hygiene. The common parasitic infection in children is *Ascaris Lumbricoides* (Round worm), *Enterobiasis vermicularis* (Pin worm), *Ancylostoma duodenale* (Hook worm), *Echinococcus granulosus* (Hydatid diseases) and *Cystercosis*. Most common worm infection in children is *Ascaris Lumbricoides*. Helminthiasis has been found to result in poor birth outcome, poor cognitive development, poor school and work performance, poor socioeconomic development, and poverty. Chronic illness, malnutrition, and anemia are further examples of secondary effects of helminthiasis.

The Ayurveda described worm infection as *Krimi Roga*. In Ayurveda term *Krimi* can be correlated with helminthiasis in modern sciences. Excessive intake of *madhura*, *amla*, eating during indigestion, avoid exercise and resorting to day sleep is main etiology in Ayurveda. Main symptom of *Krimiroga* is *Jwara* (fever) *Vivarnata* (discoloration of skin) *Sula* (Pain) *Hridayaroga* (Heart trouble) *Sadanam* (lassitude) *Bhaktadveso* (Anorexia) *Atisara* (Diarrhea) *Vamana* (Vomiting).

Ayurveda puts three basic approaches for the treatment of Helminthiasis disease such as *Apakarsana* (Removal of visible worm from the body), *Prakriti Vighata* (to create unfavorable environment by means of diet and medicine) and *Nidana Parivarjana* (Avoid etiological factor). According to *Kashyap samhita Krimi chikitsa*, *Vidanga Ghrita* kills *krimis*. This review article explores approach and treatment of worm infestation (*Krimi roga*) in children.

**Keywords:** Worm infestation, Helminthes, *Krimi Roga*, *Vidanga ghrita*, *Katu taila*

### Introduction

Helminthes or worm infestations refer to worms that live as parasites in the human body and are a fundamental cause of disease associated with health and nutrition problems beyond gastrointestinal tract disturbances [1]. Worm infestation constitutes an important limitation on growth and development of children. Infections with helminthes e.g. *Ascaris lumbricoides*, hookworm, *Hymenolepis nana* and *Trichuris trichiura* are closely linked with conditions of poverty, unsafe water, sanitation and hygiene [2]. At highest risk of morbidity are pre-school and school-aged children [3]. Negative effects of helminthes infections include diminished physical fitness and growth retardation, and delayed intellectual development and cognition. Indeed, helminthes have been linked with an increased risk for nutritional anemia, protein-energy malnutrition [4]. There are numerous species of these parasites, which are broadly classified into tapeworms, flukes, and roundworms. They often live in the gastrointestinal tract of their hosts, but they may also burrow into other organs, where they induce physiological damage. Soil-transmitted helminthes are responsible for parasitic infections in as much as a quarter of the human population worldwide. One well-known example of soil-transmitted helminthiasis is ascariasis.

**Signs and symptoms of worm infestation:** Young children have a high infection rate and suffer with a heavy worm burden of *A. lumbricoides*, *Trichuris trichiura* and/or schistosomes [5].

1. The signs and symptoms of worm infestations depend on a number of factors including: the site of the infestation within the body; the type of worm involved; the number of worms and their volume; the type of damage the infesting worms cause; and, the immunological response of the body [6].

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2. Certain worms may cause particular symptoms as taeniasis can lead to seizures due to neurocysticercosis.
3. Signs of the body's immune response may include eosinophilia, edema, and arthritis.
4. Migration of Ascaris larvae through the bronchi of the lungs can cause asthma in children.
5. Helminthiasis may cause chronic illness through malnutrition including vitamin deficiencies, stunted growth, anemia, and protein-energy malnutrition.
6. Mal nutrition can cause Anorexia in children.
7. These parasitic infections manifest themselves as reduced growth rates through impaired nutrient utilization. Consequently the children are not able to achieve their full potential in physical performance and education [7,8].
8. Heavy hookworm burden is the major etiology for iron deficiency anemia in children [9-11]

follows- They are mainly 2 types

**1. Roundworm infection (Nematodes)**

- o Soil-transmitted Helminthiasis –This includes Ascariasis (Ascaris lumbricoides), Trichuriasis and hookworm (Ancylostoma duodenale) infection
- o Filariasis (Wuchereria bancrofti ) infection
- o Enterobiasis
- o Strongyloidosis (Trichostrongylus spp.) infection
- o Trichuriasis etc.

**2. Tapeworm infection (Cestodes)**

- o Echinococcosis (Echinococcus infection)
- o Taeniasis/cysticercosis (Taenia solium) infection.

**Clinical features, Diagnosis and treatment of specific worm**

**Ascaris lumbricoides**

**Classification of Helminthes:** Helminthiasis are classified as

Clinical features	Diagnosis	Treatment
<ol style="list-style-type: none"> <li>1. Pain, distension, vomiting</li> <li>2. Passage of worms in stool/vomitus</li> <li>3. Obstruction of intestine</li> <li>4. Pulmonary:-Loeffler syndrome</li> <li>5. Growth failure</li> </ol>	<ul style="list-style-type: none"> <li>o Eggs in stool sample</li> <li>o Worms in stool / vomitus</li> <li>o Imaging</li> </ul>	<ul style="list-style-type: none"> <li>o Albendazole 400 mg Once (Taken with food)</li> <li>o Other options is Mebendazole, Ivermectin and Nitazoxanide</li> </ul>

**Enterobius Vermicularis (Pin Worm)**

Clinical features	Diagnosis	Treatment
<ol style="list-style-type: none"> <li>1. Peri-anal itching</li> <li>2. More at night</li> <li>3. Reduced appetite</li> </ol>	<ul style="list-style-type: none"> <li>o Stool microscopy: not useful Eggs can be demonstrated in perianal swabs collected early morning.</li> </ul>	<ul style="list-style-type: none"> <li>o Albendazole 400 mg Once, repeat in 2weeks</li> <li>o Other option is Mebendazole.</li> <li>o Treat entire family</li> </ul>

**Ancylostoma duodenale (Hook worm)**

Clinical features	Diagnosis	Treatment
<ol style="list-style-type: none"> <li>1. Itching</li> <li>2. Abdominal pain</li> <li>3. Anorexia</li> <li>4. Iron deficiency anemia</li> <li>5. Hypoproteinemia</li> </ol>	<ol style="list-style-type: none"> <li>1. Stool microscopy</li> <li>2. Peripheral smear</li> </ol>	<ol style="list-style-type: none"> <li>1. Albendazole 400 mg Once</li> <li>2. Oral Iron therapy</li> </ol>

**Wuchereria bancrofti (Filariasis)**

Clinical features	Diagnosis	Treatment
<ol style="list-style-type: none"> <li>1. Most remain asymptomatic</li> <li>2. Episodes of Fever, lymphangitis, lymphadenitis</li> <li>3. Tropical Pulmonary Eosinophilia</li> <li>4. Chronic stage: Lymphatic obstruction</li> </ol>	<ol style="list-style-type: none"> <li>1. Identified in thick blood film</li> <li>2. Nocturnal periodicity</li> <li>3. Adult worm in LN biopsy</li> </ol>	<ol style="list-style-type: none"> <li>1. Diethyl-Carbamazine (DEC) 6mg/kg /day q8hr for 12 days</li> <li>2. Other options is Ivermectin + Albendazole</li> </ol>

**Taeniasis**

Clinical features:-	Diagnosis	Treatment
<ol style="list-style-type: none"> <li>1. Mild epigastric discomfort,</li> <li>2. Nausea</li> <li>3. Flatulence</li> <li>4. Diarrhea</li> </ol>	<ol style="list-style-type: none"> <li>1. Microscopic identification of eggs in feces</li> </ol>	<ol style="list-style-type: none"> <li>1. Albendazole 400 mg OD for 3 days</li> </ol>

**Worm infestation in Ayurveda**

The Ayurveda described worm infection as *Krimi Roga*. The *Krimi* may be various types on the basis of their origin; *Kaphaj Krimi*, *Raktaj krimi* & *Pureeshaj Krimi*. In *Ayurveda* term *Pureeshaja Krimi* can be correlated to the helminthiasis.

**Pureeshaja Krimi:** They dwell in *Pakwasaya* and usually emerge out through anus precipitating anal etching. They result in general debility, diarrhea and brittle hair. Foetid

smell and belching occur in case of upwards movement of the worms. According to *Charak samhita* [12] *Pureeshaja Krimi* are five in number and according to *Sushruta Samhita* [13], seven in number.

**Sign and Symptoms of Worm infestation in Ayurveda:-**

**1. Pureeshaja Krimi infection:** Sign and symptoms of *Pureeshaja Krimi* infection are described in *Astang hridaya nidana* [14].

S. No	Sanskrit	English
1.	<i>Vidbheda</i>	Loose stools
2.	<i>Sula</i>	Pain
3.	<i>Vistabha</i>	Distension of abdomen
4.	<i>Malavarodha</i>	Constipation
5.	<i>Kashya</i>	Emaciation
6.	<i>Romharsha</i>	Tingling sensation
7.	<i>Agnisadana</i>	Loss of appetite
8.	<i>Gudkandu</i>	Anal itching.

### Possible Co-relation of Pureeshaja Krimi with Modern Parasites

Ayurvedic Nomenclatures	Ayurvedic Morphology or, Pathogenicity	Modern Morphology or, Pathogenicity	Habitat	Probable co-relation
1. <i>Kakeruka</i>	-	-	-	-
2. <i>Makeruka</i>	Rough ridges all over the body	-	-	-
3. <i>Leliha</i>	Shape of snake	White, small spindle shaped	Caecum, Appendix	Thread worm
4. <i>Sasulaka</i>	Pain in abdomen	Produces pain in abdomen	Large intestine	- E. histolytica - Whip worm
5. <i>Sasurada</i>	Irritation in large intestine	Irritate the intestine by eroding the lumen	Large intestine	- E. histolytica - E. Coli

## 2. Mud eating and worm infestation

Consumption of mud or such other inappropriate, non-nutritional substance increases the risk of worm infestation. This lead to *Pandu* (Anemia) which may be due to different worms.

## 3. Explanation of Harita regarding worm infestation:

According to Harita <sup>[15]</sup> *Krimis* are basically 2 types as external and internal. External are 7 types and internal are 6 types. Internal *krimis* are having its shelter in *Kapha Kostha*, *Maladhara* etc. It moves within gastro-intestinal tract just like snake. He describes shape of *Krimi* also.

S. No	Sanskrit	Shape of Krimi
1.	<i>Prithumunda</i>	Broad head, square head (like Tape worm)
2.	<i>Kanchuk</i>	Rounded head (Round worm)
3.	<i>Dhanyakurnibha</i>	Sprouted pulses with whitish sprout resembling small worm (Pin worm)
4.	<i>Sukshma</i>	Invisible
5.	<i>Anu</i>	Minute
6.	<i>Suchimukhi</i>	Tapered mouth (Hook worm)

**Treatment of Intestinal Worms (Krimi Roga) in Ayurveda**  
*Charaka Samhita* <sup>[16]</sup> gives three methods for the treatment of *Krimi roga* (Worm infestation)

1. **Apakarshana** (Removed by *Vamanadi Panchakarma* procedures)-

- If *Krimi* is visible, it should be removed by manual method.
- If no visible then *shodhana chikitsa* are apply.
- First 6 days go for the *Snehana* and *Swedana* followed by *Shodhana* on the 7<sup>th</sup> day *Vamana*.

S. No	Type of Krimi	Shodhana chikitsa
1.	<i>Pureeshaja krimi</i>	<i>Asthapana Vasti</i>
2.	<i>Kaphaja Krimi</i>	<i>Vaman and Sirovirechana</i>
3.	<i>Raktaja Krimi</i>	Treatment of <i>Kustha</i>
4.	<i>Bahyakrimi</i>	<i>Lepa, Abhyanga and Pralapa.</i>

2. **Prakriti-vighata** (Breaking the pathogenesis) –

- It can be done by giving *Katu, Tikta, Kshaya, Kshara* and *Ushana Dravyas*.
- *Kapha vardhaka ahara* with alkaline pH inside, the gut produce a favorable environment for growth of worm so avoid it.

3. **Nidana Parivarjana** (Absence from cause)-

- It means to avoid all those causes which are responsible for producing diseases like *Mithya-ahara* (eg. *Kaphavardhaka Aahara, Dugdha, Dahi, Guda* etc.), *Mithya-vihara* (eg. *Divashayana*).

**Treatment of Worm infestation in Kashyap Samhita**

1. **Vidanga Ghrita** <sup>[17]</sup>: *Saindhava lavana* is used in this *ghrita*. *Vidanga ghrita* when licked with sugar kills the

worms just like *Vajra ayudha* kills the *Rakshasas*.

2. **Bahya Krimi**: Bathing, should be done followed by treatment of *Vrana chikitsa*. While in case of infants all the above treatments should be done to the wet-nurse.
3. **Katu taila Prayoga**: After applying luke worm mustard oil mixed with salt to the anal area, mild sudation should be given by digits (fingers). This gives quick relief beneficial in pinworm which causes intense itching of the anal region at night.
4. **Certain medication for worm in Bal roga**
  - ❖ *Palash beeja*
  - ❖ *Kampillka churna*
  - ❖ *Nag keshara* is good for tapeworm
  - ❖ *Kusmand beeja swarasa*.

## 5. List of Kalpa used in Krimi Roga

S. No	Type of Preparation	Name of Preparation
1.	<i>Asava/Arishta</i>	<i>Khadiradi arishta, Vidanga arishta, Vidangaasav</i>
2.	<i>Bhasma</i>	<i>Loha Bhasma, Vanga Bhasma</i>
3.	<i>Churna</i>	<i>Vidanagadi churna</i>
4.	<i>Ghrita</i>	<i>Bimbighrita, Vidanagadighrita</i>
5.	<i>Rasa</i>	<i>Krimimudgarasa</i>

**Summary and Conclusion:** - Worm infestations are present in people of all ages but children are much more prone to it as they are at the stage of beginners to learn how to cope with these parasitic enemies. Bowel complaints are common in child suffering from worm infestation. Antihelminthic from natural sources may play key role in treatment of these parasitic infections. In last few years use of herbal medicine in treatment was increasing because of side effects associated with modern medication. Researches are being carried out now a day on large scale to discover herbal alternatives for various allopathic medications. Because modern medication use to treat worms are having side effects like hallucinations, fever, chills, confusion, nausea, vomiting, skin rashes, dark urine, blurred vision, seizures and jaundice. In *Ayurvedic* textbook various *Acharyas* has described several effective remedies for solving all kinds of worm infestations. *Apakarsana, Prakriti Visghataand Nidana Parivargana* is main line of treatment in Ayurveda for *Krimi roga*. *Kashyap Samhita* describes various remedies for treatment of *Krimi roga* in children as *Vidanga Ghrita, Katu taila Prayoga* etc.

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