A Review on the Ayurvedic Management of *Krimi* (Intestinal worms) in Children

Mukesh Kumar Meena*

*M.S. Regional Ayurveda Research Institute for Endocrine Disorders (RARIED), Jaipur-302016, Rajasthan, India

Abstract

Intestinal worm infestations are widely prevalent in tropical and subtropical countries and occur where there is poverty and poor sanitation. Recent global estimates indicate that more than a quarter of the world’s populations are infected with one or more of the parasitic infections, the most common being round worm – *Ascaris Lumbricoides* in children. Even though infection can occur at any age, the highest rate is in preschool or early school-age children. The most common etiological and risk factors are poverty, ignorance, lack of hygiene, poor sanitation and use of uncooked food or improper washing of food materials etc. Transmission is primarily hand to mouth, but may also involve ingestion of contaminated raw fruits and vegetables. In *Ayurveda* the infectious diseases caused by *krimi* are explained under the title of *Oupasargikarogas*. The term *Krimi* is a broad term which includes all types of worms and microbes. That may be pathogenic or non-pathogenic. Among them, pathogenic is harmful to human beings and helminthiasis specifically can be correlated to the *Pureeshaja* type of *Krimi*. Treatment like *Apakarshana* (elimination therapy), *PrakrutiVighata* (to create an unfavourable environment) and *NidanaParivarjana* (avoiding the etiology) is found to be very effective to treat *Krimi* in *Ayurveda*. Inspite of this it is more economical, painless treatment with no or minimum side effects. The present article reviews the concept of *krimi* and role of *Ayurveda* in the management of *krimi* in children.

Keywords

*Krimi, Oupasargika, helminthiasis, Apakarshana*

INTRODUCTION
The prevalence of Intestinal worm infestations more found in tropical and subtropical countries and elevated by poverty and poor sanitation. According to WHO, more than 1.5 billion people or 24% of the world’s population are infected with soil-transmitted helminths (STH). Out of them 270 million preschool-age children and 600 million school-age children live in areas where STH is transmitted. Morbidity due to STH was estimated to be 39 million, or almost 8% of the disease burden due to infectious diseases. Geohelminths (soil-transmitted helminthes, STHs) are a group of intestinal parasites causing human infection through contact with parasite eggs or larvae that thrive in warm and moist soil and belong to the class nematode, which includes roundworms (Ascaris lumbricoides), whipworms (Trichuris trichiura), and two hookworms (Ancylostoma duodenale and Necator americanus). Most of these are transmitted through soil, there route of transmission being feacal contaminated fingers or sometimes migrate through skin to intestine. Intestinal worm infection spread rapidly by poor sanitation, scarcity of potable drinking water and poor personal hygiene. These infections cause morbidity and mortality along with other manifestations like iron deficiency anaemia, growth retardation in children and other physical and health problems. Helminthic infection is also related to protein energy malnutrition, low pregnancy weight and intra-uterine weight gain. In addition to their health effects, an intestinal helminthic infection impairs cognition in children and hinders economic development.

**Definition of Krimi:** “Krinathihimsathiithi Krimi”11. Although the colloquial meaning of Krimi refers to worms, by etymology it is defined as the one which causes sufferings. Even from the Vedas references have been cited regarding Krimi12–13 as those are responsible for illness, disease or death. The GrahaRogas may be compared to infectious diseases, caused by pathogenic micro-organisms. Krimi has wide range including all Apada-Bahupada, pathogenic – non-pathogenic, movable and alive organisms in it. Acharya Charka explained Krimirogabased on Hetvadisaptakagana (seven specific aspects)14. It is said that Krimi is itself one of the cause for Kushtha, Pandu, Grahani, Karshyata etc.15. In present and fast forward life people are lacking in awareness about
nutrition & diet, due to this many patients become sufferer of Krimiroga and they remains as it is or without undiagnosed. The intestinal worms are affected children as well as adult, but more common in children. Because at present, today in the community, peoples are mostly favour non veg diet, fast food, milk & butter product, sweet product, faulty prepared food or fermented food and all these factors aggregate in outcome of Krimiroga. Since the Vedic period the Krimi are one of the oldest companions of the human beings. Ancient Acharyas were well aware regarding the presence of the Krimiroga (microorganism). There are some indirect references in Vedas for microbes and infectious diseases in the name of Krimi and Krimi Rogas.

**Origin of Krimi:** According to Achariya Charaka, Kleda in the body is one of the factors for the production of Krimi.

**Types of Krimi:** 20 varieties of Krimis that have been illustrated are broadly classified into Bahya (external) and Abhyantara Krimi (internal).

**According to effect on the body -**

i) Sahaja or Non Pathogenic

ii) Vaikarika or Pathogenic.

**Sahaja Krimi:** Sahaja Krimi is defined as types of Krimis which are normally reside in the human body without producing any harmful effect on the body. It appears that by Sahaja Krimis are referred to those organisms which are present in the various part of the body like buccal cavity, alimentary tract, as well as in the vaginal canal in females and play a role in maintain normal bacterial flora. In Charaka their presence is described not to be harmful to humans (and indeed they help us by producing vitamin B12 in the intestines and by competing with and thus in healthy subjects preventing the growth of pathogenic organisms.

**Vaikariaka Krimi:** It consists of those Krimis which are harmful to human body. According to Charaka and Ashatanghardtiyam, these Vaikarika Krimis two sub- types as:

i. Bahya or External Krimi e.g. - Yuka, Liksha etc.

ii. Abhyantara or Internal - who remain inside the body. These internal Krimies also further 3 sub types as:

i. Kaphaja,

ii. Raktaja

iii. Pureeshaja

Udara Krimi intestinal worms generally include – Pureeshaja and Kaphaja Krimi. These types of Krimis are mainly described elaborately with their pathogenicity in Ayurvedic classics.
Table 1: Total number of *Krimi* according to their Sites as mentioned in different *Ayurvedic* text

<table>
<thead>
<tr>
<th>S.no.</th>
<th>Text</th>
<th>Bahya or Malaja Krimi (External)</th>
<th>Abhyantara Krimi (Internal)</th>
<th>Total No. of Krimi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Charaka Samhita</td>
<td>2</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>Sushruta Samhita</td>
<td>-</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>Astangahriddya</td>
<td>2</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 2: Site of *Krimi* as mentioned in *Brihatrayi*

<table>
<thead>
<tr>
<th>S.no</th>
<th>Text</th>
<th>Malaja</th>
<th>Raktaja</th>
<th>Kaphaja</th>
<th>Pureeshaaja</th>
<th>Malaja</th>
<th>Raktaja</th>
<th>Kaphaja</th>
<th>Pureeshaaja</th>
<th>Malaja</th>
<th>Raktaja</th>
<th>Kaphaja</th>
<th>Pureeshaaja</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Sushruta Samhita</td>
<td>-</td>
<td>-</td>
<td>Amashaya</td>
<td>Pakvashaya</td>
<td>-</td>
<td>-</td>
<td>Amashaya</td>
<td>Pakvashaya</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Astangahriddya</td>
<td>Kesha, Loma</td>
<td>Rakta-VahiniSira</td>
<td>Amashaya</td>
<td>Amashaya</td>
<td>Kesha, Loma</td>
<td>Rakta-VahiniSira</td>
<td>Amashaya</td>
<td>Amashaya</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to above classification *Kaphaja* and *Pureeshajakrimis* may be correlated to intestinal worms (helminthes) as evident in table no. 2.

*SamanyaKrimiNidana* (Common aetiology): *Nidanarefers to the causative factors which can be broadly divided into AharaSambandiNindana (food-related) and ViharaSambandiNidana (activity-related).* *AharaSambandi*: Milk, jaggery, sesameum, fish, meat or and other products that cause *KaphaUtklesham*, besides, also includes the food which are unctuous, sweet, heavy, cold items etc. *ViharaSambandi*: *Divaswapna*(day sleep), *Asana &Avyayama*(prolonged sitting which indirectly indicates lack of exercise).

*Specific signs of Krimis:* *AcharyaCharaka* has been described three *VisheshaRoopas* (cardinal signs) such as *Purishabheda* (unformed stools), *Karshya* (emaciation), *Lomaharsha* (cutis anserina). *General signs and symptoms Of AbhyantaraKrimis:* *AcharyaSusrutahas quoted* general symptoms are described as: – *Jwara* (fever), *Vivarnata* (discolouration), *Shoola* (pain), *Hridroga* (diseases of the heart), *Bhrama* (giddiness), *Bhaktadwesha* (disinterest towards food), *Atisara* (diarrhoea), *Sadana* (tiredness), *Chardi* (vomiting) and *Swasa* (breathlessness).

*KrimiSamanyaChikitsa*: (General line of treatment) *AcharyaCharaka* has given three principles for treating the patients of *Krimiroga.* These are *Apakarshana,* *Prakrutiviha* and *NidanaParivarjana*.
i. **Apakarshana:** Visible *Krimi* are to be manually extracted by bare hand or by *Yantra* (instruments like *sandamsha* while extraction of internal worms with the help of *Sansodhana* therapy includes: *Vamana* (Therapeutic vomiting or emesis), *Virechan* (Purgation), *Vasti* (mediated enema), *Nasya* (elimination of toxins through the nose).

ii. **PrakrutiVighata:**

*Prakriti* = *PrakarotiitiPrakriti*, which can produce is the *Prakriti* i.e. causative factor and *Vighata* = *Vinasha*, means which is to be destroyed, get effected etc., means the *Prakriti* or the producing factor to be destroyed is the *PrakritiVighata*. With the help of *Katu*, *Tikta*, *Kashaya*, *Kshara*, *Ushana* *Dravyas* and the *Dravyas* which are opposite to property of *Kapha* and *Purisha*, performs the function of *Prakritivighata*.

*Kapha* and *Purisha* is the main *Prakriti* of *Krimis*. Properties of *Kapha* (Snigdha, Sheeta, Guru, Manda, Shlakshana, Sandra, Madhura, Picchila) after producing *Agnimandya*, starts the formation of Ama which may favour for the formation of *KaphajaKrimi* and in the same way when Sara-kitta- vibhajana take place, *Sarabhaga* performs the function of *Shariraposhana* (nutrition) and *Kittabhaga* is excreted out, being it is *Vijatiya*. But if this *Vijatiya* portion (*Kittabhaga*) due to any reason accumulates in *Pakwashaya*, there it starts *Kotha* (putrefaction) leading to the formation of *Pureeshajakrimi*. So here *Purisha* will act as its *Prakriti* i.e. causative factor. That’s why *acharyaCharak* advises to make use of *dravyas* which possess the opposite properties to the *Kapha* and *Purisha* e.g. *Katu* – *Tikta* – *Kashaya* – *Ushna* – *KsharaDravyas*, because they are exactly opposite to their *Prakriti* and by this action they performs the duty of *Prakritivighata*.

These are advised in all aspects of the patient daily activities i.e. in food, drinks, for washing etc. With regard to the pharmacological action, drugs possessing *krimigna* (anti-microbial) properties have been enumerated like *Maricha* (Piper nigrum), *Gandira* (Amorphophalluscampanulatus), *Vidanga* (Embeliaribes) etc. Additionally various classical formulations with *Danti* (Baliospermummontanum) and *Dravanti* (Chlorophytumtuberosum), *Tilvaka* (Viburnumnervosum) and *Udallaka* (Bauhiniavariegata) *kashayaetc* have also been mentioned.  

*Nidanaaparivarjana:* (avoiding the causative factors)
This is the third principle in the treatment of the *Krimi* as avoidance of etiological factors (*Nidanaparivarjana*). Hence, all the factors listed as etiological factors of the *Krimiroga* and *Apthya* should be avoided. It is most useful from three points such as:

I. It may cut off the necessity of *Aushadhi*.
II. Extra-contaminated intake is prohibited.
III. Helps to treat the patient and relieve him early.

Presently in modern medical science prevention is by improved sanitation, which includes improving access to toilets and proper disposal of feces. Hand washing with soap appears protective.

**DISCUSSION**

Intestinal worm infestation is a global health problem and is a matter of serious concern for the third world countries. Overcrowding, contamination of water, poor sanitation and migration of people to cities greatly favour transmission of parasitic infection resulting in high endemicity. Most important group of intestinal worms is STH infections, which are responsible for 27% of entire school-age and preschool-age children population in the World, whom required anthelminthic treatment. Ascariasis is the most prevalent human helminthiasis and its high rate is found in tropical areas of the world due to environmental conditions which are optimal for maturation of ova in the soil. As previous studies shown the, helminthic infections especially Ascariasis caused by Round worm (*AscarisLumbricoides*) is a common manifestation. With the knowledge of worms from both the systems of medicine, *PureeshajaKrimi* and its affliction can be co-related to Ascariasis and Ascarislumbricoides as they share a lot of similarities. Some of them are explained below:

**General features of *PureeshajaKrimi* such as:**

**I. Sthana (Site):** *Pakvashaya* which is stated as the *Sthana* for *PureeshajaKrimi*, is considered as a part of intestine between Ileocecal junction and sigmoid colon. According to the modern parasitology, organisms like adult Ascarislumbricoides (round worms), live in the small intestine and eggs are passed in the

**II. Akruty (Shape):** *PureeshajaKrimi* has been described as *Sookshma* (minute), *Vritha* (round), *Deergha* (long), *Sthoola* (big), *Prithavapucks* (flat tail) and *Tanu* (thin).

On the other hand Ascarislumbricoides has also been identified to be around, elongated worm measuring 45-70 μm in length and 35-50 μm in breadth.
III. **Varna (color):** Pureeshaja Krimi is mentioned to possess colours like Shweta (white), Shyava(pale), Neela(blue), Harita(green), Peeta(yellow) 37. Nonetheless, Ascaris worms are also smooth cream colored surface too 38. According to Sushruta Gandupada 39 Krimis have been clearly mentioned in Pureeshaja type, which can be correlated with „Round Worm” in modern science. In Harita Samhita accumulation of Purisha is the main cause for internal type of Krimi, infesting which more like snake in the Kaphakoshtha is explained here. Krimis name according to their shape, size and habitat. For example Pruthumunda, Sukshma, Anavaha and Suchimukhate 40.

Hence with the above substantiation it can be assumed that Ascarislumbricoides can be considered as a type of Pureeshaja Krimi in Ayurveda.

Ascarislumbricoides is responsible for pulmonary disease and obstruction of the intestinal orbiliary tract in children 41.

**Common sign and Symptoms of Pulmonary Ascariasis:** The pulmonary Ascariasis manifestations resemble Loeffler syndrome and include transient respiratory symptoms such as cough and dyspnoea, pulmonary infiltrates, and blood eosinophilia 42; these sign and symptoms may be correlated to Shleshmaja Krimi as mentioned in Ayurvedic text such as: Hrillasa (nausea), Asyasanshrawan (salivation), Avipaka (indigestion), Jwara (fever), Arochaka (anorexia), Moorchha (fainting), Jrimbha (yawning), Kshavathu (sneeze), Anaha (temperitis), Angamarda (body ache), Chhardi (vomiting), Karshya (emaciation), Parushya (dryness of skin), Kasa (cough), Pinasa (chronic rhinitis), Shula (acute pain), Shwayathu (oedema), Hridroga, Pratishyaya, Shiroroga 43.

**Common sign and Symptoms of Intestinal Ascariasis:** Intestinal ascariasis has no symptoms in more than 85% of cases, especially if the number of worms is small 44. A more serious complication occurs when a large mass of worms leads to acute bowel obstruction. Vomiting, abdominal distension, and cramps are most common complaints of children suffering from heavy worms infections. In some cases, worms may be passed in the vomitus or stools. Ascaris worms occasionally migrate into the biliary and pancreatic ducts, where they cause cholecystitis or pancreatitis. Studies show that chronic infection with A. lumbricoides (often coincident with other helminth infections) impairs growth, physical fitness, and cognitive development 45. All the above sign and symptoms may be
correlated in *Ayurveda* with signs & symptoms of *Pureeshajakrimis* such as: *Purishabhedha* (diarrhoea), *Karshya* (emaciation), *Parushya* (dryness of skin), *Lomaharsha* (horripilation), *Gudamuhanishkramana* (coming out from anus), *Gudakandu* (pruritisani), *Shula* (acute pain), *Agnimandya* (loss of appetite), *Pandu* (anaemia), *Vishtambha* (constipation & flatulence), *Balakshaya* (weakness), *Praseka* (salivation), *Aruchi* (anorexia), *Hridroga*. In present era increasing demand of herbal as well Ayurvedic medicines, maintaining quality standards is the prime need of hour some Ayurvedic medicine have anthelmintic properties. Anthelmintic plants that are used traditionally in expelling the worms that is parasitic in nature from the body either by stunning or killing them. They are also known as Vermifuges or Vermicides. AchariyaKashyapa has quoted the administration of bitter and pungent drugs in *Krimirogas* are well explained. Medicated bath is indicated to destroy the external *Krimis* in *DwivraniyaAdhyaya* and mentioned only the total number of *Krimis* in children.

**Below are listed a few research studies on anthelmintic properties:**

1. The aqueous extract of *Sesbania graminiflora* the leaves recorded a definite anthelmintic efficacy against *A. galli*.

2. In-vitro anthelmintic activity of *Acorus-calamus* leaves, preliminary phytochemical screening of crude extract revealed the presence of tannins, steroids, flavonoids, Saponins and terpinoids. The presence of these phyto-constituents showed a significant anthelmintic activity on Pheretimaposthuma at all the tested doses when compared to control.

3. Methanolic leaf extract of *Tephrosiapurpurea* showed the presence of alkaloids, carbohydrates, flavanoids, tannins and phenolic compounds and the presence of these phytoconstituents were responsible for anthelmintic activity.

4. The methanol extract of *Buteamonosperma* seeds, tested in vitro, showed significant anthelmintic activity.


6. Dash Durgaprasad (2001) treatment of *Krimiroga* with the extract of *Hyosyamusniger* Linn- Puri. Above studies have thus revealed the efficacy of Ayurvedic compounds in the
treatment of PureeshajaKrimi or intestinal worms infection.

**CONCLUSION**

High prevalence of intestinal worm infestation is an indicator of poor living conditions and low standards of sanitation in a society. The present review article reveals prevention and Ayurvedic management of PureeshajaKrimiroga (Intestinal worm infection) in children by Prakrutivighata, NidanaParivarjana, through improve their sanitary and living conditions by treatment of infected individuals and provision of potable water. An inference can be drawn form the description of Shleshamaja and PureeshajaKrimi i.e. perhaps the ShleshmajaKrimis are the migrating larvae of nematodes and also parasites present in upper gastro intestinal tract, and PureeshajaKrimis are the intestinal parasites in general.
REFERENCES


3. Centre for Disease Control and Prevention (2013), Available at http://www.cdc.gov/parasites/sth/


32. Fung IC, Cairncross S. (Mar 2009). Ascariasis and handwashing, Transactions


