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Review of *Krimi* with contemporary understanding

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ABSTRACT

Krimi is used as broad sense for all worms and micro-organisms perspective of modern science. In *Samhita* Period there is ample description regarding *Nidana*, *Bheda*, *Lakshana* and *Chikitsa* of *Krimi*. In present day science, microbiology and helminthology are the separate branches including all the worms and microbe. Classification of *Krimi* has been mentioned by different authors with its site, etiology, symptoms and treatment. *Krimi* can be correlated with parasites and microorganisms mentioned in modern science. The disease associated with *Krimi* also discussed in this article.

Key words: *Krimi*, *Samhita* period, microbiology, helminthology.

INTRODUCTION

In *Ayurveda* the word *Krimi* is used as broad sense for all worms and microorganisms' perspective of modern science. Concept of *Krimi* is not new its description is found since Vedic period. The visible or invisible i.e., macro or micro-organisms that affect the living & non-living things of biosphere are described in *Ayurvedic* literature.^[1]

In *Shabdakalpadruma* *Krimi* is derived as "*Bhrame Samprasarane Cha*" means which moves with *Pada* or legs (*podia*).^[2] According to *Veda* *Krimi* originate in different areas like *Parvata*, *Vana*, *Oushadhi*, *Pashu*, *Apshu* etc.^[3] *Krimi* derived from *Dhatu* "*Kunja*

Himsayam" which literary means either to produce fatal effects or to destroy. *Charaka* informed *Kleda* in the body is one of the factors for *Krimi* production.^[4] In *Samhita* Period there is ample description regarding *Nidana*, *Bheda*, *Lakshana* and *Chikitsa* of *Krimi*. In present day science, microbiology and helminthology are the separate branches including all the worms and microbes. In this article an attempt was made to analyze the *Krimi* with contemporary understanding.

Classification of *Krimi*

The following table shows the total number and divisions of *Krimi* according to different *Acharyas*. [Table 1]^[5]

Table 1: Number of *Krimi* according different authors

Name of Acharya	Bah ya Kri mi	Abhyantara Krimi			Total Abhyan tara Krimi	Tot al Kri mi
		Kaph aja	Purish aja	Rakt aja		
<i>Charaka</i> ^[6]	2	7	5	6	18	20
<i>Susruta</i> ^[7]		6	7	7	20	20
<i>Vagbhat</i> ^[8]	2	7	5	6	18	20

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Madhavak ara ^[9]	2	7	5	6	18	20
Sarangadh ara ^[10]	2	7	5	6	18	20
Bhavaprak ash ^[11]	2	7	5	6	18	20

Table 2: Nomenclature and site of Krimi according to Acharya Charaka^[12]

SN	Type of Krimi	Name of the Krimi	Site of the Krimi
1.	Bahya	Yuka, Pipilika	Hair, Eyelashes, Skin, Clothing
2.	Kaphaja	Antrada, Udarada, Hrudayacara, Curu, Darbhapuspa, Saugandhika, Mahaguda	Amasaya, from Amasaya spread up and down
3.	Purishaja	Kakeruka, Makeruka, Sausurada, Sasulaka, Leliha	Pakvashaya, spread towards anus and also towards Amasaya
4.	Raktaja	Kesada, Lomada, Lomodvipa, Saurasa, Audumbara, Jantumatarah.	Raktavahini, Dhamani

Causative factors of Krimi in general

The *Bahya* or external *Krimi* are produced due to “*Mrija Barjana*” means unhygienic and dirty habits.^[13] Regarding *Abhyantar Krimi* some general and some specific etiological factors mentioned. The common causative factors include *Ajeernabhojana*, regular intake of *Madhura* and *Amla Rasa*, consumption of *Drava* substances, *Guda*, *Virudhha Bhojana* etc. Some physical factors are also mentioned in common *Nidana* like *Divaswapna* and *Avyayama*.

Table 3: Samprapti Ghataka of Krimi Roga

Dosha	Tridosha mainly Kapha Pittaja
Dushya	Datu: Rasa, Raktha, Mamsa

	<i>Mala: Purishya</i> later on <i>Mamsa, Sira, Snayu</i>
Srotas	<i>Rasa, Rakta, Annavaha, Raktavaha, Purishavaha</i>
Sroto Dushti Lakshana	<i>Sanga, Vimarga Gamana, Atipravrtti, Granthi</i>
Agni	<i>Jatharagni and Dhatwagni Mandya</i>
Sthana	<i>Amasaya, Pakvashaya, Rakta or Sarva Sharira</i>
Vyatka	<i>Krimi Prabhava</i>

Description of Krimi and its correlation with parasites and microorganisms

Bahya Krimi : Yuka

Yuka can be correlated to with the sucking lice (*Pediculus humanus* species). It is wingless with distinct head, thorax (bearing three pairs of clawed legs) and abdomen (seven segments). It has multiple legs and it is blood sucking species.

Mainly 3 types

- The body louse (*Pediculus humanus capitis*)
- Head louse (*Pediculus H corporis*)
- Pubic louse (*Phthirus pubis*)

Mode of infection: Personal contact and exchange of clothing's etc.

Effect: Inject salivary fluids to wound during ingestion, causes intense itching (constant scratching - bacterial infection of wounds), inflammatory papules, pigmentations in the skin.

Pipilika

Corresponds to a very tender insect. Appearance may be like ants but it corresponds to *liksha*.

Mites - Mites may cause an intense dermatitis

- Itch mites (*Sarcoptes scabiei*)
- Black head mites (*Demodex folliculorum*).

Ticks - Ticks are obligate blood feeders

- Hard (ixodid) ticks (chitinous shield)
- Soft (argasid) ticks

Abhyantara Krimi : Kaphaja Krimi**Antrada : Hook worm - *Ankylostoma duodenale***

Adult worm lives in the small intestine of man, particularly jejunum, less often in duodenum. It is small, greyish white cylindrical worm. Bend dorsally, hence the name hookworm. Freshly passed worm is reddish-brown because of ingested blood in its intestine.

Udarada : Tape worm (*T. solium* and *T. saginata*)

The adult worm lives in small intestine & upper jejunum of man and lies in several folds in the lumen. This move against the peristaltic movement in the host's intestine. It is opalescent white in colour, 2-10 meters in length. Proglottids (Segments) - 800-1000 in no.

Mahaguda : Round worm (*Ascaris lumbricoides*)

Habitat - small intestine (jejunum) it is cylindrical with tapering ends up to 40cm in length. Freshly passed worms will be light brown or pink in colour that changes gradually to white.

Life cycle

- Definitive host - Human beings
- Intermediate host - not required
- Infective form - embrocated eggs
- Source - contaminated food, drinking or raw vegetables

Mode of infection- ingestion, inhalation of polluted dust particles containing embrocated eggs

Hridayachara : *Trichinella spiralis*

Morphology - Smallest nematode infecting man, just visible to naked eye, white in colour. Anterior half of body is thin and pointed. Posterior end of male has a pair of pear shaped clasping papillae on either side.

Life cycle

- Definitive host - pigs/rats and human beings.
- Intermediate host - not required.
- Infective form - encysted larvae.

- Source - improperly cooked pork

Mode of infection: Ingestion.

Raktaja Krimi**Keshada, Lomada, Lomadvipa : *Tinea capitis***

It is infected to shaft of scalp hair. Infected hair is dull-gray, which break to form patches of alopecia.

Types

1. **Keroin** - It is painful, inflammatory lesion; form mass on scalp, suppurate, form sinus and discharge pus; caused by *T. verrucosum* and *T. mentagrophytes*.
2. **Favus** - Waxy honeycomb-like crusts are formed around hair follicles and cause patchy alopecia and scarring; caused by *T. schoenleinii*, *T. violaceum*.

Udumbara: *Tinea corporis*

It is infection of no hairy skin of the body. It results from extension of infection from groin, scalp or beard area and shows single or multiple confluent erythematous, scaly, annular, sharply margined lesions. Fungal metabolites may diffuse to deeper layers and cause erythema, vesicle or pustule along with pruritus caused by *T. rubrum*, *T. mentagrophytes*.

Purishaja Krimi**Kakeruka: *Trichuris trichiura***

It is attached to the wall of caecum and appendix. It is adult worm and it is pinkish-white, resembles a whip. The anterior 3/4th thin, hair like and coiled. The posterior 2/5th is thick and stout- whip worm.

Makeruka: *Enterobius vermicularis* (pin worm, thread worm, seat worm)

It will be seen in caecum, vermiform appendix and adjacent part of ascending colon. After mating, the male usually dies and is passed in faeces. The gravid female migrates down the colon to rectum. At night the worm comes out through anus and crawls about on the perianal and perineal skin to lay its sticky eggs. It is adult worm. It is small, white, spindle-shaped, resembles a piece of white thread.

Sasurada: Balantidium coli

It is largest protozoan and only ciliate that infects human beings. It lives in the large intestine, caecum and terminal ileum. They feed on debris of intestinal wall, starch grains, bacteria and mucus. It is trophozoite and oval, 60-70mm. Motility - motile with the help of cilia covered all over the body. Anterior end is narrow, shows cytostome (mouth) and cytopharynx. Posterior end is broad, shows small pore

Sign and Symptoms

Both general and specific sign and symptoms of *Krimi Roga* are described in *Samhita*. The general sign and symptoms include *Jvara* (fever), *Vivarnata* (skin discoloration), *Sula* (acute pain in abdomen), *Hrudroga*, *Bhrama* (vertigo), *Bhaktadwesa* (anorexia), *Atisara* (diarrhea) *Sadana* (malaise) and *Chardi* (vomiting).^[14]

Specific sign and symptoms

Bahya Krimi - Itching and urticaria rashes in the body.^[15]

Kaphaja Krimi - *Hrillasa*, *Asyasamsravana*, *Avipaka*, *Arochaka*, *Jvara*, *Murchha*, *Jrimbha*, *Kshavathu*, *Anaha*, *Angamarda*, *Chhardi*, *Karshya*, *Parusya*, *Kasa*, *Pinasa*, *Sula*, *Svayathu*, *Hrudroga*, *Pratisyaya*, *Siroroga*.^[16]

Purishaja Krimi - *Purisabheda*, *Karshya*, *Parusya*, *Lomaharsa*, *Gudaniskramana*, *Guda Kandu*, *Sula*, *Agnimandya*, *Pandu*, *Visthambha*, *Bala Kshaya*, *Praseka Aruchi*, *Hridroga*.^[17]

Raktaja Krimi - *Raktaja Vyadhi*, *Kesa Samshru Nakha*, *Loma Pakshma*, *Dhwamsa*, *Harsa*, *Kandu*, *Toda*, excessively grown *Krimi* eat away skin, vessels, ligaments, muscles, cartilages and tissues.^[18]

Krimi in relation to other diseases

The growth and effect of *Krimi* may cause several diseases and some diseases listed here, they are *Mritbhakshana Janya Pandu* (anemia), *Chardi* (vomiting), *Atisara* (diarrhea), *Krimija Hridroga*, *Krimija Shiroroga*, *Karna Krimi* and *Nasa Krimi* or *Raktaja Pratisyaya* (nasal myiasis).

Mritbhakshana Janya Pandu (Anaemia due to intake of mud)

Habitual intake of clay or mud aggravates one of the three *Dosha* based on its *Rasa* like if mud is of *Tikta* (astringent), it aggravates *Vata Dosha*; If mud is of *Lavana* and *Kshara* (saline with alkaline), it aggravates *Pitta* and if it is *Sweet (Madhura)*, it aggravates *Kapha Dosha*. The sign and symptoms manifested in this type of *Pandu* are *Shuna Ganda Akshi Kuta* (oedema in the cheek, eye socket and eye bone), oedema in feet and umbilical region. It also causes *Krimi Koshta* (Appearance of worms in intestine) and loose stool associated with blood and mucus.

Chardi (Vomiting)

Chardi is caused due to excessive intake of liquid food, excessive consumption of unwholesome food, excessive intake of salty food, untimely intake of food, exhaustion, fear, indigestion, *Krimi doha* (infection), pregnancy, eating food in hurry etc.

Atisara (Diarrhea)

Atisara is of various types based on aggravation of *Dosha*. *Sannipataja Atisara* is a combined effect of these *Dosha*. *Sannipataja Atisara* caused due to intake of excessive cold, unctuous, dry, hot and heavy food, intake of unwholesome food, avoiding food, excess intake of alcohol, *Krimi Dosha* (infection) etc.

Krimija Hrudroga

It is caused due to intake of sesame and its products, milk, *Guda* while having *Hridroga*. It forms a *Granthi* in a portion of *Hridaya Marma*. This cyst or *Granthi* filled with *Kleda* (vicious fluid). To this *Rasa* in circulation gets added and increases *Kleda*. This forms an ideal environment for manifestation of *Krimi*. These manifested *Krimi* causes severe pain and discomfort in heart.

Krimija Shiroroga

It is a kind of disease of head or head ache caused by worm infestation or infection. It is also called as *Krimija Shirashula* or *Krimija Shirobhitapa*. In this disease person have headache in which person feel throbbing and pulsating pain within the bones of head, feels as if

something is eating off brain or brain membranes and discharges pus mixed fluids from nose.

Krimi Karna

Krimi Karna refers to maggots in ear and it is one of the various disease mentioned in 15th century in *Yogasarasangraha* by *Acharya Vasudeva*.

Nasa Krimi or Raktaja Pratishyaya (nasal myiasis)

In this disease causative factors are low digestive power, increase of *Kapha Dosha*, allergens, unwholesome food. *Pratishyaya* is classified based on symptoms they are *Vataja*, *Kaphaja*, *Vata-Kaphaja*, *Kapha-Vataja*, *Raktaja* and *Kapha-Raktaja*.

Table 4: Krimi in relation with other diseases.

SN	Diseases	Relation with Krimi
1.	<i>Mritbhakshana Janya Pandu</i> (anemia)	In this type of <i>Pandu Krimikoshta</i> (worms in intestine) appears as sign and symptoms
2.	<i>Chardi</i> (vomiting)	<i>Krimi Dosha</i> (Infection) is one of the causative factors.
3.	<i>Atisara</i> (diarrhea)	<i>Krimi Dosha</i> is one of the causative factors.
4.	<i>Krimija Hridroga</i>	Manifestation of <i>Krimi</i> is the main cause for this disease
5.	<i>Krimija Shiroroga</i>	Manifestation of <i>Krimi</i> is the main cause for this disease
6.	<i>Karna Krimi</i>	Manifestation of <i>Krimi</i> in ear (maggots in ear)
7.	<i>Nasa Krimi or Raktaja Pratishyaya</i> (nasal myiasis)	<i>Krimi Dosha</i> (Infection) is one of the causative factor and symptom.

Treatment for Krimi Roga

Acharya Charaka described three basic methods for the treatment of *Koshtagata Krimi* such as - *Apakarshana* (Removed by *Vamanadi Panchakarma* procedures), *Prakritivighata* (Breaking the pathogenesis), and *Nidana Parivarjana* (Absence from cause).

Apakarshana: *Apakarsana* of *Krimi* includes the manual and instrumental removal *Krimi*. *Apakarsana* or removal of the *Bahya Krimi* (external) should be done by manual method. Removal of *Abhyantara Krimi* by *Virechana*, *Vamana*, *Sirovirechana* and *Asthapana Basti* process.

Prakriti Vighatana: *Prakriti Vighatana* are inhibiting factors which responsible for the inhibition of growth and production of *Krimi* by *Dravyas* having *Katu*, *Tikta*, *Kashaya* and *Ushna Guna*.

Nidana Parivarjana: It helps to eliminate the causative factors which promote the germinating and growing of the *Krimi*.

DISCUSSION

The word *Krimi* has broad meaning in *Ayurveda* for worms and microorganisms. Since the *Vedic* period its existence was found but in *Samhita* period detail study about the type of *Krimi*, its morphology, pathogenesis, clinical features and management was found very clearly.^[1] The correlation of the *Krimi* with microbes and parasites depend upon their habitat, available morphological character along with sign and symptoms they produce in host. Individual probable correlation of all the *Krimi* with microorganisms is quite difficult but some of the *Krimi* produce similar features like microbes and parasites.^[5] In this article *Bahya Krimi Yuka* and *Pipilika* is correlated sucking lice, mites and ticks and *Abhyantara Krimi* is correlated with parasites and micro-organisms. *Kaphaja Krimi* is correlated with hook worm (*Ankylostoma duodenale*), round worm (*Ascaris lumbricoides*) and tape worm (*T. solium* and *T. saginata*). *Purishaja Krimi* is correlated with *Trichuris trichiura*, *Enterobius vermicularis* (pin worm, thread worm, seat worm), *Balantidium coli*. *Raktaja Krimi* can be correlated to *Tinea capitis* and *Tinea corporis*. In this article *Krimi* associated with diseases like *Mritbhakshana Janya Pandu*, *Chardi*, *Atisara*, *Krimija Hridroga*, *Krimija Shiroroga*, *Krimi Karna* and *Nasa Krimi* mentioned in brief.

CONCLUSION

Concept of *Krimi* and *Krimi Roga* are available since *Vedic* period, but detailed descriptions are found in

Samhita period along with treatment of *Krimi Roga*. Based on the clinical features and habitat inside host *Krimi* can be compared with various microorganism and parasites. The clinical conditions originating from *Krimi* can be understood with different parasiting infections. There is a further scope to evaluate *Krimi Chikitsa* explained in *Ayurveda* in contemporary parasitic diseases.

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