



Krimi; Worm Infestation in URDHWAJATRUGATA Roga: An Ayurvedic Review with Contemporary Correlation

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Abstract

Introduction: Microorganisms, trauma, an improper lifestyle, an unhygienic diet, and autoimmune disorders are among the factors associated with disease. Pioneers of Ayurvedic literature have mentioned twenty types of Krimi (worms or Microorganisms). “Bahya Krimi and Abhyantara Krimi are the two major categories. Purishaja, Kaphaja and Shleshmaja Krimi are responsible for pathological manifestation of disease. Out of them few are responsible for the disease or deformity of the organ related to Urdhwajatru (organ above the clavicle). Acharya has described Krimi in Netra, Siro, Kapala, Karna, Nasa and Mukha-Gata Roga. The Kushta (Hansen’s disease), caused by Krimi is a major contributor to deformities and diseases of the Shalakya Tantra. The specific Krimi named Sirshada, Dantada, Majjada are included in the literature by different Acharya.

Discussion- Based on the clinical features, the Maggots or Larvae may be correlated with the Krimi of Raktaja Pratishyaya, Dushtapratishyaya, Pratishyaya and Arunshika. The Deformity caused by the Krimi to the Tarunasthi (cartilage) of Nose and Ears are because of the Hansen’s disease. The Krimi in Krimija Sirashoola may be correlated with parasitic infections of the brain (e.g., neurocysticercosis). The Loiasis and Parasitic Blepharitis by Phthiriasis Palpebrarum can be correlated to the Krimi in Netra as seen in Krimigranthi.

Conclusion: The Krimi are nothing but the visible or invisible parasites of the Human body. The visible parasites are Jantumata, Maggots or larvae, originated by the vector flies. And the invisible Krimi or parasites are Raktaja Krimi or other Microorganisms. Krimi described in KrimijaSirashoola may be compared with parasitic infections affecting the central nervous system, such as neurocysticercosis.

Keywords: Krimi, Krimi in Urdhwajatrugata Roga, Worm infestation in eye, ear, nose and oral cavity.

Introduction

Diseases are manifested because of improper, unhygienic diet, improper lifestyle, Microorganisms, external factors and due to autoimmune disorders. Those are extensively described in contemporary medical science. In Ayurveda, the external factors responsible for disease are trauma, Desha (locality), Kaala (Time), Jala (water), Vayu (air) and Krimi (worms, Microorganisms) [1]. Krimi are described by many Acharyas in the Brihat-Trayi and Laghu-Trayi. There are twenty types of Krimi explained in Brihat-Trayee. Bahya and Abhyantara Krimi are the two major type of Krimi explained in the Samhita. The Abhyantara Krimi are Purishaja, Kaphaja and Shleshmaja [2, 3, 4]. Acharya Sushruta did not include the Bahya Krimi, and he added that the Raktaja Krimi of Abhyantara Krimi are invisible [3]. “In Shalakya Tantra, Acharyas describe Krimi in Netra, Siro, Kapala, Karna, Nasa, and Mukha-gataRoga [5, 6, 7]. The Kushta (Hansen’s disease), caused by Krimi is also a major contributor of sensory impairment, deformity related to oral cavity, Vocal cord, Nasal cartilage, and hearing. The Krimi are nothing but the visible or invisible parasites of the Human body. The specific Krimi named Sirshada, Dantada, Majjada Krimi are included in the literature by different Acharya. These visible Krimi are Maggots or larvae, and the invisible are Raktaja Krimi or the parasitic microorganism. In this literary review an effort is been made to compile the disease of Shalakya Tantra, where Krimi is involved in the manifestation of disease with its probable contemporary correlations.

Methodology

Krimi and diseases related to Shalakya Tantra were explored by reviewing ancient texts, focusing on the types, features, pathophysiology, preventive and curative treatment PubMed, Google Scholar, and the Ayurveda Research Database were searched. Research Database was also reviewed. All published articles were collected and assessed by reviewing their titles, abstracts, and full texts. The information gathered was then organized and critically reviewed for

this manuscript.

Observation and Results

Krimi are of two types; Drishta and Adrishta. It may be Durnama and Sunama Krimi, Sahaaja and Vaikarika or Bahya and Abhyantara Krimi [2]. Acharya Sushruta did not explain Bahya Krimi. Acharya of Ayurveda also named the Krimi according to their presence on the body. Acharya of Brihat-Trayee described twenty types of Krimi whereas Acharya Harita mentioned thirteen and Sarangadhara explained twenty-one types of Krimi [8, 9, 10]. (Table 1)

Among these twenty Krimi some affect the hairs and skin of the body. (Table 2). Acharya Charaka has explained Bahya Krimi as two, whereas the Kaphaja, Raktaja and Purishaja Krimi are seven, six and five respectively. These three are Abhyantara Krimi. Acharya Sushruta described six, seven and six; Kaphaja, Raktaja and Purishaja Krimi [2, 3, 4]. Sarangadhara followed the view of Acharya Vagbhata but included one more Krimi as Shleshma-Raktaka [9].

a. Bahya Krimi or Malaja Krimi are not considered by Acharya Sushruta. Maharshi Charaka and Vagbhata consider those Krimi under Malaj or Bahya Krimi. These are Yuka (Likha) and Pipilika. These originated due to unhygienic condition from Mala or Sweda and located in Hair and cloth of human body. They are small, white or black colored, Til seed like, located in hairs, cloths. These Krimi are small and have six or multiple legs. They cause, itching, Rashes, Pidika and vesicles on the body [2].

b. Abhyantara Krimi:- Table 1, 2, 3, 4.

Purishaja – Purishaja Krimi are seven in number. These are minute, some are thick and thick tail. They look like white rounded, long, like wool. Some are, round, dark-brown, blue, green, and yellow in color. Those are present in Pakwashaya (Large intestine). They appear due to Ahita (unhygiene) Ahara (food) Vihara Sevana and spread to the Adhah Marga (anus). This worm manifestations causes Agnimandya, Pain abdomen, General weakness, Pandu, Salivation, Aruchi, Hrid-Roga, Atisara, Kushta, Horripilation, Toda (pricking pain) at anus and come out of the Anus [2].

Kaphaja/ Shleshmaja- Kaphaja Krimi are six in number, located in Amashaya and Antra. Kaphaja Krimi are hairy, they have long hairs on head, they are tailed, Shyava Varna, Mandala over body and have sprout like appearance. Those are Minute, whitish, red colored, thin or thick, long, wide, rounded, and earthworm like in appearance.

There will be intestinal ulceration, Antarik Jwara (enteric fever), salivation, anorexia, indigestion, fever, loss of consciousness, nausea, flatulence, Kshavathu and Netra Parusha (stiffness in eyes) [2,3].

Raktaja- Raktaja Krimi are seven in number. These are slippery, wider, red or black in color, very minute, round, legless, Tamra Varna. They are invisible and sit in Dhamani or Sira, Raktavahi Dhamani. They cause dental carries. There will be body hair loss, when it increases in number; it destroys the Tarunasthi [2,3].

The Purishaja (seven) and Kaphaja (six) are visible forms of Krimi whereas the seven Raktaja Krimi are invisible Krimi [3]. The Keshada and Romada are incurable [3].

Table 1– The Different types of Krimi according to different Acharya and Samhita. [2, 3, 4, 8, 9]

SAMHITA	PURISHAJA	KAPHAJA	RAKTAJA	BAHYA KRIMI
Charaka Samhita	1. Kakeruka 2. Makeruka 3. Leliha 4. Sashoolaka 5. Shausurad a	1. Antrada 2. Udarada 3. Hridyachara 4. Mahaguda 5. Churu 6. Darbhpushpa 7. Sugandhika	1. Keshada 2. Lomada 3. Lomadvip a 4. Saurasa 5. Udumbara 6. Jantumatra	1. Yuka 2. Liksha
Sushruta Samhita	1. Ajawa 2. Vijawa 3. Kipyra 4. Chipira 5. Gandupada 6. Churu 7. Dvimukha	1. Darbhpushpa 2. Mahapushpa 3. Praloona 4. Chipita 5. Pippalika 6. Daruna	1. Keshada 2. Romada 3. Nakhada 4. Dantada 5. Kikkisha 6. Kushtaja 7. Parisarpa	Not explained.

Vagbhata	1. Kakeruka 2. Makeruka 3. Sausurada 4. Saluna or sasulaka 5. Leliha	1. Annada 2. Udaravesta 3. Hridayada 4. Mahakuha 5. Kuru 6. Darvakusuma 7. Sugandha or saugandhika	1. Keshada 2. Loma- vidhwansha 1. Lomadipa 2. Udumbara 3. Saurasa 4. Mata or Jantumata	Bahirmala- 1. Yuka 2. Likha. and its one bheda is chamanchu (located on the skin of axilla, anus, clitoris)
Madhava Nidana	1. Kakeruka 2. Makeruka 3. Leliha 4. Sashoolaka 5. Shausurad a	1. Antrada 2. Udarada 3. Hridyachara 4. Mahaguda 5. Churu 6. Darbhapushpa 7. Sugandhika	1. Keshada 2. Lomada 3. Lomadvip a 4. Saurasa 5. Udumbara 6. Jantumata	Yuka, Liksha

Table 2- Number of Krimi according to different Acharya. [2, 3, 4, 8, 9, 10, 11, 12]

Sl. No.	Samhita	Bahya (External)	Abhyantara Krimi (Internal)				Total No. of Krimi
			Kaphaja	Raktaja	Purishaja	Sleshma-Raktaja	
1.	Charaka	2	7	6	5	0	20
2.	Sushruta	0	6	7	7	0	20
	Astanga Hridaya	2	7	6	5	0	20
3.	Bhela	0	0	0	0	0	20
4.	Harita	7	0	0	0	0	13
4.	Sarangdhara	2	7	6	5	1	21
6.	Yoga- Ratnakara. Madhava Nidana, Bhava Prakasha	2	7	6	5	0	20

The different types of Krimi are also explained in the Shalakya Tantra by Brihat-Trayee and Laghutrayee. They have also described the shape, size of the Krimi and about the clinical features of the respective Krimi-Roga. The following are the features of the Krimi related to Shalakya Tantra.

Common treatment of Krimi

Treatment of Krimi are Apakarshana (extraction), Prakritivighata (Opposite Aushadha, Ahara, Vihara) and Nidana Parivarjana (avoiding Causative factor) [2]. Apakarshana Chikitsa is the removal of Krimi from their site.

The Nashya or Sirovirechana, Vamana, Virechana, Asthapana Basti, finger and Yantra are used to remove of the Krimi from their location. Prakriti Vighata is the administration of Medicine, diet and lifestyle exactly opposite to the nature and property of Krimi. The Nidana Parivarjana is nothing but to stop and avoid the etiological factors. In this condition Ushna, Katu, Tikta, Kashaya, Kshara medications may be used for the treatment. Krimi of Netra, Karna, Nasa and Siro are usually treated with Anjana, Nashya, Avapida Nashya, Kavala, Gandusha [13].

Different Yoga for Sirasada Krimi

Snehana, Swedana followed by Siro Virechana with Apamarga Tandula Churna Pradhamana Nashya. Dhoomapana with Surasadigana Dravya. The Pradhamana Nashya prepared from the dried powder of Horse dung dry powder mixed with Vidanga Kwatha and this dried powder will be used as Nashya. Kangshya, or Sisaka (lead) rubbed with Vidanga Kwatha and used as Nashya with Surasadi Gana Sidha Taila. And the treatment protocol of Indralupta may be adopted. [13]

Krimi-Nasaka Yavagu

Sarjikshyara mixed with the Yavagu prepared from the Takra processed with Bidanga, Pippalimoola, Shigru, Maricha should be used orally [53].

Krimihara Nashya

Apamarga should be used as Siro-Virechaka Nashya in Krimija Siroroga [54].

Krimi in Siroroga

All the Acharya of Brihat-trayee introduced a specific and separate disease as Krimija Siroroga in the context of Siro Roga. Acharya Charaka mentioned that due to Unhygienic, improper diet regimen, over-eating or taking food without proper digestion led to aggravation of Rakta, Kapha, Mamsa and development of Klinnata inside the body tissue. Klinnata (state of oozing, pathological context or putrefaction) of Dhatu is excessive lubrication, moisturization and wetness within the body tissue. These factors inside the body usually lead to swelling, discharge, Suppuration and sloughing. Thus, creating a favorable condition for the Krimi to grow within. Lakshana of Krimi in Siro Roga-pricking pain, cutting type of pain, Headache, Itching, Swelling, foul smell of the head [14, 15].

There will be Toda (pricking Pain) feeling of something destroying or brain matter, Headache, filling of cracking of scalp bone or skull as feeling as if something moving in the brain. There will be blood stained Nasasrava. [16]. Jwara, Kasa, loss of body strength, Kapala Rukshyata, Swelling, Cutting or probing type of pain, burning sensation, Nasa, Mukha Durgandhata, Itching of Siro, Talu, forehead, Dryness of mouth, Coppery Shrava from nose, and there will be Tinnitus seen in Krimija Siro-Roga [17].

The Sirshada Krimi of Siro can be treated with the Apamarga as Siro-Virechana [18, 19]. The Majjada Krimi, a Kaphaja Krimi destroy the Majja and Causes Siro Roga [3]. So, these Krimi are Kaphaja in nature. This state of Krimi in brain matter may be correlated with Neurocysticercosis. This is a tap worm infestation from the eggs of Taenia solium or Taenia saginata. It is usually spread through the faeco-oral route. The water, liquid food, drinks, half boiled Cabbage and other vegetable are the source of infection. In this condition seizure, headache, focal deficits and cognitive abnormalities are the two major symptoms seen in this case [20]. Siro roga is also caused by Saugandhika or Udaravestha Kaphaja Krimi [2, 4].

Treatment Krimija Siroroga-Charaka stated, Raktamokshyana in Krimija Siroroga [21]. While describing the treatment of Krimija Siro Roga; Acharya Charaka mentioned about the use of Tikshna Nashya. Thus, the Krimi of the Siro will come out through the nostrils and through the oral cavity [21].

Rakta Nashya is adopted to remove the Krimi through the Nasal cavity. Instillation of Tikshna Nashya followed by extraction of the Krimi through the Kurchka Yantra and application of Siro Virechaka Nashya. Then instillation of Sigu Beeja, with Kamshya and Neela to be used as Nashya. Kriminashaka Dravya with Goat urine for Nashya is adopted to treat the Krimija Siro Roga. The rotten fish along with the Krimihara Dravya should be selected for Dhooma to attract the Krimi to come out of the Nasal Cavity or Siro [22, 23]. Apamargadi Taila and processed oil of Trikatu, Karanja, Sigu paste and Goat urine are used as Nashya in Krimija Siroroga. [24].

Kapala Gata Roga-Arunshika is included under Kshudra Roga in Sushruta Samhita. There will be Pidika with multiple Opening and there will be mucopurulent Discharge. These are all due to derangement of Kapha, Rakta and buy the action of local Krimi or local parasites [25]. The involvement of Krimi is also found in Arunshika disease of Kapala (Scalp). It is caused due to aggravation of Pitta, Rakta, Kapha and Krimi. There will be small Pidika (Vesicle) looking like grain of Kangu Dhanya or yellow mustard seed [26, 27]. The smell of mucopurulent discharge attracts the fly, and the fly, lay their eggs, which may hatch into larvae or maggots. In Raktaja Krimi the Keshada, Lomada, Romadipa or Lomadipa are responsible for destruction of Hair, Hair follicle [18].

Treatment (Table 3)-Processed oil applications, Medicinal Paste application are the treatment protocol followed for Arunshika. Along with this protocol the Sodhana therapy like Jalaukavacharana, Vamana, Siro Virechana and Dhoomapana are also effective [28].

Table 3- Showing different formulation for the treatment of Arunshika [23, 28, 39, 59]

Formulation No.	Ingredients	Indication	Mode of Application
Formulation 1	Yashtimadhu, Komala, Tila, Eranda, Arka Patra	Arunshika	Lepa/ Poultice
Formulation 2	Sarsapa, Moolaka and Sigru and Cow urine	Arunshika	Lepa/ Poultice
Formulation 3	Netrabala, Amalaki, and seeds of Moolaka and Sarshapa with milk	Arunshika	Lepa/ Poultice
Formulation 4	Yashtimadhu, Bark of Sirisha tree	Arunshika	Lepa/ Poultice
Formulation 5	Oil prepared from fried Kutha; fried in the earthen pot to be applied with Sarshapa Taila.	Kandu, Kleda, daha, Sweda, Vedana.	Oil application
Formulation 6	Chitrakadi Taila	Arunshika, Indralupta	Oil application
Formulation 7	Oil prepared from Danti, Patha, Koshataki, Chitraka, Atashi, Mahalangali.	Brana in Arunshika	Oil application
Formulation 8	The oil processed with the paste prepared from Manahashila, Haratala and root powder of Ela, Pippali, Kushta, Kashisha, Haridra, Karanja, Mustha, Tagara, Bidanga, Sarshapa, Chitraka, Karabira under snlight (without physical fire).	Brana in Arunshika	Oil application
Formulation 9	Potala Patra, Nimba Patra, Haridra	Arunshika	Lepa/ Poultice
Formulation 10	Triphala Ghrita	Arunshika	Oil application
Formulation 11	Khadira, Nimba, Jambu Bark paste with Cow urine	Arunshika	Lepa/ Poultice
Formulation 12	Paste prepared from Bark of Kutaja, Saindhava Lavana with Cow urine.	Arunshika	Lepa/ Poultice

After washing the head with Nimba Kashaya, Lepa with salt mixed with the horse dung. And it must be kept for few minutes. The scalp is washed with warm water, Kanji or Amla Rasa followed by Lepa with Bidanga, Trikatu, Lakshya, Gruhadhuma, Manahashila, Hartala, Bacha, Rasanjan, Daruharidra and Hari dra.

Paste prepared from Yashtimadhu, Komala, Tila, Eranda, Arka Patra to be applied over the Scalp. Application of paste prepared from Sarsapa, Moolaka and Sigru and Cow urine over the scalp in Arunshika. Poultice prepared from the paste of Netrabala, Amalaki, and seeds of Moolaka and Sarshapa with milk. The paste prepared from the Yashtimadhu, Bark of Sirisha tree can be applied over the scalp.

Krimi in Netra Roga

The disease Krimigranthi is an example of this category. It is a disease of Netra Sandhi (junction of eye, lid margin, fornix in this case). It is a Kaphaja and curable disease of eyeball. The site of the disease manifestation is on the lid margin, palpebral conjunctiva and in the fornix. In Krimigranthi, Krimi is seen on the lid margin and fornix and there will be itching in those areas [29]. Acharya Vagbhata specify this disease as the site of warm manifestation at inner or outer canthus. There will be purulent cystic appearance and there will be itching, burning sensation, pus discharge, madarosis and appearance of Krimi on the purulent cystic growth. In Raktaja Krimi the Keshada, Lomada, Romadipa or Lomadipa are responsible for destruction of eye lashes and its follicle [18]. So, this may be correlated to the Krimi in Krimigranthi. The Majjada Krimi, a Kaphaja Krimi destroys the Netra or eye. So that there will be loss of vision or visual impairment [3]. Acharya Sushruta mentioned redness of eye and origin of Krimi while describing the Lakshana of Pittaja Kushta [30]. This is also the Lakshana of Asthi and Majja Dhatugata Kushta [30].

Treatment-Krimigranthi is cured with venipuncture, Bhedana (Incision) and Anjana (collyrium).

Correlation- The Netra Gata Krimi may be considered to the Parasitic blepharitis. It is caused by the crab louse responsible for Demodex folliculorum and Phthiriasis Palpebrarum infection. There will be nits and crab louse at the lashes and lid margin [31]. Filarial nematode causes Loiasis. This disease is due to Loa loa, an African eye worm. This is transmitted by deer flies in the genus Chrysops spp. It localizes in the subconjunctiva of the eye and can cause irritation, inflammation, foreign-body sensation of eye and mimic the symptomatology of allergic conjunctivitis [32].

Krimi in Karna Roga

There will be worm manifestation in Krimikarna Roga and in Parilehika or Lehya, a Bahya Karna Roga. Majjada Krimi destroys the ear [3]. And deformity in ear Tarunasthi (ear cartilage) is a clinical feature of Kushta [3, 46].

Krimikarna-Untreated ulcer created by abrasion, trauma to the external auditory canal may lead to putrefaction in the meatal skin, cartilage and muscle of ear canal. This leads to origin of the Krimi. Acharya also added that the flies sit on the wound of the ear and lay eggs. Thus, the worms originated [33]. Aggravation of Tridosha leads to putrefaction of the Mamsa and Rakta Dhatu, which is the cause and origin of Krimi [34]. In this regard the Jantumata or Mata may be considered [35]. While describing the disease Krimikarna Acharya Bhava Mishra followed the view of Acharya Vagbhata but he also mentioned the presence of winged insect, centipede and other insect in ear cavity in the Krimikarna disease [58]. Majjada Kaphaja Krimi destroyed the Ear [3]. This can be the functional impairment of ear or hearing impairment. Karnanaada or Tinnitus is a clinical feature of ear disease seen in Krimija Siro-Roga caused by Krimi [26].

Parilehika: Itching, burning sensation, painful discharge, vesicular lesion like mustard seed are the clinical feature of Parilehika. This is due to Krimi, Kapha and Rakta Dosha. If the disease is ignored, then there will be destruction of the ear lobule [36]. The Krimi and aggravated Kapha and Rakta are the factor for these features. If this is untreated it will lead to destruction of the ear lobule [34].

Treatment of Krimi in Karna Roga-Karna Dhoopana, oil processed with Krimihara Dravya as ear drops are recommended in the Krimi Karna. Karna Dhoopana with the dried fruit of brinjal or Brihat Kantakari. Drop wise installation of Lukewarm Sarsapa Taila [37]. Hartala Powder to be mixed with cow urine and instilled in the ears. Guggulu Dhoopana can be administered to the ears, if there any foul smelling. Vamana, Dhoomapana, Kavala can also be considered in the treatment of Krimikarna [38].

Shigru bark Swarasa, Swarasa of Hul-hul, Trikatu, Kapikachhu, root Swarasa, to be mix and instilled in ears. Alcohol and Hingu can be instilled in ears separately [39]. Kshara Taila is used to reduce ear discharge and to also improve hearing [59].

Parilehika-Swedana with dry Cow dung followed by Lepa of Bidanga Beeja with Sheep urine. Lepa with the paste prepared from Kutaja, Ingudi Beeja, Karanja Beeja, Amalatasa bark with Sheep urine. Brana Lepana with processed mustard oil with Kutaja, Nimba Patra, Maricha, bee wax Paste [40].

Krimi in Nasa Roga

Nasagata Krimi is seen in two cases of Nasaroga as in Raktaja Pratishyaya and in Dushta-Pratishyaya. The deformity in the nose by means of Tarunasthi (cartilage) destruction, Pratishyaya, Pinasa Roga, Tamra-varna nasa shrava, Kshyabhatu [2, 3, 4, 17] are due to Kushta and Kaphaja Krimi.

Raktaja Pratishyaya-In Raktaja Pratishyaya; small, white, slippery, Krimi will be seen. Along with the Krimi, there will be blood stained nasal discharge, lack of smell sensation, foul smell from nose and oral cavity. The Krimija Siroroga sign and symptoms will also be seen this Nasaroga [41]. Acharya Vagbhata did not explain in the disease Raktaja Pratishyaya.

In the treatment of Krimija Nasaroga Acharya advised to go for Nashya Karma with Krimihara Dravya. Krimihara Dravya like Bidanga is to be mixed with cow urine and used as Nashya. Krimihara Dravya Nashya and Surasadi-Gana Dravya are used for Krimi Roga [42].

DushtaPratishyaya- Acharya Vagbhata explained Krimi in Dushtapratishyaya. He stated that sometimes there will be Krimi in Dushtapratishyaya and those will look like, long, slippery, whitish and minute in appearance [43]. In its treatment, it was told to treat with Krimihara Dravya. This condition of Krimi in Aural and in the Nasal cavity can be correlated to the Myiasis. The Myiasis of the nasal cavity is caused by Callitroga, Lucilia and Musca flies. These flies lay their eggs in the nasal cavity [44]. The infection may also be carried out by maggot/ larva of or larvae of Chrysommia bezziana. These also seen in case of atrophic rhinitis, Syphilis, Leprosy, infected wound and in malignancies of nose and paranasal sinus [45]. The flies are attracted by the foul smell of the aural discharge and lay eggs in the cavity, which hatch out into larvae and are called maggot. These Larvae feed themselves from the nasal discharge and dead tissue and get grown. They destroy the nasal tissue and cartilage. The Jantumata Krimi responsible for the Nasagata Krimi are caused due to flies, which are also the main cause of Nasal Myiasis.[35]. This condition of Cartilage destruction can be compared with the Tarunasthi destruction, which is the action of Pittaja Kushta and Asthi, Majja Dhatugata Krimi, or by the action of Majjada Kaphaja Krimi [47]. Acharya Sushruta clearly mentioned that there will be Angabhanga as Karna-Nasa-Bhanga and origin of Krimi in Pittaja Kushta [30].

In Kushta Roga, Tarunasthi of Nasa, Karna are destroyed by Saurasa Krimi, a Raktaja Krimi [2, 46]. Saugandhika or Udaravestha Kaphaja Krimi are the causative factor for Kshyabhatu and Pinasa Roga[2, 4]. Pratishyaya and Coppery nasal discharge are caused due to Majjada Kaphaja Krimi and Krimija Siro-Roga respectively. [3, 17]

Krimi in Mukha Roga

In Ayurveda Krimidanta is described to be caused by Krimi Apart from this Acharya also mentioned that Mukha-Paka, Mukha Pidika (oral ulcer), stiffness in the oral cavity, Talu sosha (Dryness/Deformity/ Destruction of Palate), Swarabheda (Voice impairment) and the emergence of Krimi are due to the Kustha Roga.

Danta Roga-In Dantaroga Acharya Sushruta and Vagbhata explained the tooth destruction due to Krimi, as Krimidanta. There will be cavity formation due to dryness of the tooth marrow caused by the action of Vata predominant Tridosha. This cavity is filled with waste food particles and there occurs putrefaction. Thus, giving rise to the origin of minute invisible Krimi. Then there will be purulent discharge, severe pain, development of

tooth mobility and bleeding from the mobile tooth [48]. While describing the treatment protocol of Krimidanta, Acharya mentioned filling the cavity with Jaggery or Bee-wax followed by Agnikarma. Then the cavity must fill with the latex of Arka or Saptachhada. If the tooth is not mobile then Raktamokshyana should adopted and if mobile application of Snigdha Lepa, Nashya and Gandusha should consider [49]. In Krimiroga Acharya mentioned the Dantada-Krimi, a Raktaja Krimi, responsible for Krimidanta. Acharya Vagbhatta clearly mentioned the pathophysiology of Krimidanta in his Samhita. The destruction of tooth elements and formation of cavity in the tooth are due to the action of Krimi [13,50].

Abnormalities or destruction of the Talu (palate) is attributed to Majjada Krimi, a type of Kaphaja Krimi [3]. Voice impairment, known as Swara-Upaghata or Swara Bhanga, is characteristic feature of Vataja Kushta and is specifically observed in the Asthi and Majjagata Kushta Roga [47]. Furthermore, Mamsagata Kushta Lakshana is marked by Mukha-Sosha (dryness of the mouth), ulcerations, stiffness in the oral cavity, and the emergence of Krimi [47]. Similarly, dryness of the forehead, mouth, and both the soft and hard palates are clinical features of Krimija Siro-Roga [17]. Abhyantara Krimi is cause of Kushtaroga [51]. So, the characteristics features of the deformities caused in the Urdhwajatru due to Kushta roga are also because of Krimi. The Krimi here will be the *Mycobacterium leprae*, responsible for **Hansen's disease**.

Contemporary Correlation of Krimidanta is Tooth Carries. In this condition there is formation of dental biofilm, which is a protective sheath of bacterial colony on the Dental surface. The biofilm is a structured dental plaque, present over the enamel and cementum. Those are embedded in polysaccharide matrix and help bacteria to adhere to the dental surface. The biofilm present as supragingival plaque causes dental caries and other gingival and periodontal disorder like gingivitis and periodontitis [52]. So, this is an example of Microorganisms specifically related to the tooth.

Table 4-The Krimi in details related to Urdhwajatrugata Roga and other part of body.

Table 4- The Krimi in details related to Urdhwaajatrugata Roga and other part of body.				
Krimi Type and Name	Origin	Site of presence	Shape size	Disease / Sign/ Symptom
Bahya / Malaja [2] 1. Yuka and Likha 2. Pipilika.	Unhygienic condition. From Mala or sweda	Anus, Hairs, Cloths. Looks like color of hair and seen on hair, cloths, on the hair and cloths	Like- black Tila, Shape -Small, Many legs.Likha- Eggs of “Yuka” seen on the hair.	Itchy Anus, Pain abdomen, Flatulence, Loose motion. Itching, Rashes, Pidika and Vesicles.
Sushruta 1. Keshada 2. Romada 3. Nakhada 4. Dantada 5. Kikkisha 6. Kushthaja 7. Parisarpa. Charaka & Vagbhatta 1. Keshada 2. Lomada 3. Loma dipa 4. Saurasa 5. Audumbara 6. Jantumatru or Jantu mata or Mata or Matru	Raktaja Krimi [3, 2, 51] Sushruta- 6, Charaka- 6, Astanga Hridaya- 6 Common character of Raktakja Krimi			
	The Fly sit on the wound and produces Krimi.	Dhamani or Raktavahi Dhamani, hair root. Tarunasthi,	Very minute, round, legless. Udumbara vat, slippery, wider, Tamra varna, red or black in color. They may be visible or invisible	Dental carries, Destroy the hair root, Body hair loss, Destroy the Tarunasthi (Karna, Nasa as in Kushta),
	Keshada.[2]	Hair of all part of Body and Skin.		Hair loss, Destroy the Tarunasthi Kushta roga vat chikitsa. So, it may be compared with the nasal bridge deviation or destruction.
	Lomadwipa			Destroys the hair follicles.
	Romada			Destroys the skin hair.
	Lomada			Destroys skin hair.
	Dantada	Danta		Dental caries.
	Saurasa	Tarunasthi		Destroys the Hairs, snayu, Mamsa, Tarunasti of Nasa, Karna
	Jantu Matru / Matru/ mata	Hair, Lid Lashes, All the Hair of body		Kushtaroga Karaka. Can be correlated to the

				Krimi of Karna and Nasa and Arunshika.
Sirshada [2]	Described in the treatment of Siro Krimi.	Krimi of Siro	-	Probably caused Krimija Siroroga and treated with Siro virechana with Apamarga.
Sushruta 1. Darbha PushpaMahapushpa 2. Praluna 3. Chipita 4. Daruna 5. Pipillika. Charaka & Vagbhata 1. Antrada 2. Udarada 3. Hridaya Chara (Ashtanga hridayada) 4. Churu 5. Darbhpushpa 6. Saugandhika (Nasa and Siro located) 7. Mahaguda.	Kaphaja Krimi [3, 2, 51, 55] Common character of Kaphaja Krimi Sushruta- 6, Charaka- 7, Astanga Hridaya- 7			
	Amashaya & intestine.	It spreads upward and down word. Some are Whitish, Thick, wide; Some are rounded, wide, like earthworm, whitish or red in color. Some are Minute, Long and white in color. Some are Minute, Long and white in color	Hairy, long hairs on head, they are tailed, Shyava Varna Mandala over body and have sprout like appearance. Those are whitish colored and thin. [3]	Lala Srava, arochaka, Ajirna, Jwara, Murchha, Nausea, Flactulence, Kshyabhathu, Netra Parusha Ulcerated the intestine. Enteric fever, intestinal loss
	Saugandhika (Vagbhata-Udaravesta)	Nasa and Siro [2]	-	Kshyabhathu, Netra Parusha, Lala Srava, Kshyabhathu, Pinasa Roga/ Pratishyaya. [2, 4, 55]
Kaphaja	Majjada [2]	Siro, Hridaya, Nasa, Talu, Netra, Karna,	-	Siro Roga, Hrid roga, Pratishyaya, Taluroga. Destroy the Netra, Karna, Talu
Charaka & Vagbhata 1. Kakeruka 2. Makeruka 3. Leliha 4. Sashulaka 5. Sausarada. Sushruta 1. Ajawa 2. Vijawa 3. Kipyra 4. Chippa 5. Gandupada 6. Churu 7. Dvimukha	Purishaja Krimi Common characteristic of Purishaja Krimi Sushruta- 7, Charaka- 5, Astanga Hrudaya- 5			
	-	Pakwashaya. Ahitakara ahara vihara sevana and spread to the adhah marga (lower body part).	Minute rounded, white, long, like wool. Some are thick, round, some have thick tail, dark-brown, blue, green, and yellow in color.	Agnimandya, Pain abdomen, General weakness, Pandu, Salivation, Aruchi, and Hrid-roga, Atisara, Krushata, Horripilation, Hard, pricking pain at Anus, Itchy anus, and come out of the Anus.
	-	Rakta varna, Long, Anal region, Itchy Anus, Pain abdomen, Flatulence, Loose motion.	White, Minute, Thick tailed,	Bishtambha, Arochaka, Hrid roga, Atisara, Toda at Anus, Pain abdomen, Flatulence, Pandu, Lalasrava, weakness Agni Mandya, Bishtambha, Arochaka, Hrid roga, Atisara.
	Gandupada Krimi[3]	Siro	-	Krimija Siro Roga

-	Sirshada, Majjada	Kapala	-	Arunshika
-	-	Netra	-	Krimigranthi
-	Sirshada	Netra	-	Visual impairment or loss of vision
Kushtaja Krimi	-	Karna	-	Krimi karna
Kaphaja	Majjada	Karna Paali/Suskali	-	Tantrika
Krimi of Kushta, Raktaja	Majjada, Saurasa	Nasa	-	Dushtapratishyaya, Raktaja Pratishyaya
Kaphaja	Saugandhika / Udaravesta.	Nasa	-	Kshyabhathu, Pinasa Roga/ Pratishyaya [2, 4]
Kaphaja and Krimi of Kushta	Majjada & Saurasa	Nasa Tarunasthi	-	Nasa Tarunasthi destruction or deformity.
Raktaja	Dantada	Danta (Mukh)	-	Krimi Danta
Raktaja Krimi/ Kusthaja Krimi	-	Mukha	-	Mukha-Paka, Mukha Pidika.
Krimi of Kushta	-	Talu	-	Talu Sosha
Krimi of Kushta	-	Kanta	-	Swarabheda
Krimi Type and Name	Origin	Site of presence	Shape size	Disease / Sign/ Symptom

Discussion

Worm infestation in Urdhwajatrugata Roga are mainly due to Kaphaja and Raktaja Krimi. As the Kushta Roga is due to Krimi, the sign and symptoms seen in Kustha can be considered as the result of Krimi. The cartilage of ear and nasal deviation or destruction, redness of eye, visual impairment or loss of vision, voice impairment, Oral ulcers are due to the Kushta because of Vata, Pitta and Kushta involvement in Mamsa, Asthi and Majja Dhatu. Here the Krimi means the causative Microorganisms Mycobacterium leprae responsible for the impairment of eye, oral cavity, Nose, ear and vocal cord.

In **Sirogata Roga** the Krimi involvement are seen in Krimija Siroroga. And the destruction of brain matter as seen in Majjada Krimi infestation. There the involvement of Sirasada and Majjada Krimi are described in literature. This condition of Siroroga can be correlated to the Neurocysticercosis, where the Taenia solium is the causative organism. And in this case severe headache and Seizure are the two important clinical features. So, the Taenia solium is the causative Krimi.

In the disease of **Kapala** or scalp; there will be loss or destruction of hair due to involvement of Raktaja Krimi like Keshada, Lomada and Romada and Romadipa. This condition of hair damage, hair loss, or Hair fall may be seen in the head louse. And in Arunshika, the Krimi involved may be due to the foul smell of mucopurulent discharge, to which the fly attracts and lay their eggs, later those eggs hatch into larvae or maggot. This Krimi may be compared with the Jantumata of Raktaja Krimi. This condition is correlated to the maggot.

In Disease of **Netra**; in Krimigranthi, may be correlated to the parasitic blepharitis. The Krimi involved in this case is nothing but the crab louse responsible for Demodex folliculorum and Phthiriasis Palpebrarum infection [31]. The visual loss, impairment or destruction of eye are due to the Majjada Kaphaja Krimi. This may be a cause of Taenia solium infection as seen in Neurocysticercosis. The Loa loa filarial nematode worm may also correlate to this Krimigranthi as the worm infested under the conjunctiva with swelling and irritation [32]. So, this condition may also be co-related to the Krimigranthi.

While describing the Krimi infestation in **Nasa Roga**; Acharya included them in Raktaja Pratishya, Dushtapratishya, Krimija Siro Roga, Majjada Kaphaja Krimi and in Kushta Roga due to Piita predominance. The Raktaja Pratishyaya and Dushtapratishyaya are because of the worm infestation caused by the fly. This is nothing but the Jantumata Krimi involvement, a type of Raktaja Krimi. The Majjada Kaphaja Krimi also causes Pinasa or Pratishyaya Roga. These should be the Nasal Myiasis because of the Callitroga, Lucilia and Musca flies. The Nasal cartilage, bone deformity and destruction are because of the Saurasa Raktaja Krimi. This is seen in Kushta Roga, which may be correlated to the complication of leprosy [44,45]. In **Karna Roga** the Krimi Karna, Parilehika and Destruction of ear matter are explained in the classical literature. The Aural Myiasis may be correlated to the Krimikarna and Parilehika whereas the Ear matter destruction may be compared to the complication of Leprosy. These aural maggots are caused by Callitroga, Lucilia and Musca flies and the larvae of Chrysommia bezziana. The Ear destruction due to Majjada Kaphaja Krimi may also be correlated to the aural Myiasis [44,45]. This

destruction of ear matter may be correlated to the hearing impairment.

In **Mukhagata Roga**, the Krimidanta is caused by Dantada Raktaja Krimi, which destroys the tooth matter. As the Krimi originated from Rakta and these are invisible, this is clearly denoting to wars the bacteria causing the biofilm and lead to carries tooth [52]. In the oral cavity, the Ulcer, Pidika (blisters), Destruction of Palate, Swarabheda are described as the Predominance of Pitta in Kushta and the Swarabheda as Vattik Predominance. These may be considered as the symptom and complication of Leprosy [56,57]. The Bahya-Krimi, Raktaja and Kaphaja Krimi are involved in the manifestation of disease of the Head, Scalp, Hair, Eye, Nose, Ear and oral cavity disease. The Neurocysticercosis, maggot in scalp, nose and ear are the Krimi that can be visible to the bare eyes whereas the other Krimi involved in oral ulcer, blister, Krimidanta, Swarabheda (Voice impairment), Nasa-Bhanga (nasal cartilage deformity), visual and hearing impairment, Hair loss or fall, are not visible to bare eyes. There is no Purishaja Krimi directly involved in the manifestation of Urdhwajatrugata Roga.

Conclusion

The Krimi are nothing but the visible or invisible parasites of the Human body. The visible parasites are Maggots or larvae, Jantumata which, originated by the vector flies. And the invisible Krimi or parasites are Raktaja Krimi, Krimi or Microorganisms responsible for Leprosy or may be the other parasitic microorganisms of the human body. The Krimi manifestation in Urdhwajatrugata Roga are responsible for the impairment, deformity or destruction of the structures in sense organ. Krimi in Raktajapratishtaya, Dushtapratishtaya of Nasa Roga, Krimikarna, Parilehika in Karna Roga and Arunshika in Kapala Roga are due to the larvae and maggots of flies. But the Saurasa Krimi, destroying the cartilage of nose and ear are due to the Krimi of Kushta or Mycobacterium leprae of Hansen's disease. Neurocysticercosis caused by Taenia Solium infection is responsible for Krimija Siroroga is because of Sirshada or Majjada Krimi in Ayurveda. The Krimi in Krimidanta are due to Dantada Krimi or the bacterial infection. The voice impairment or Swara Bhanga as in Kushta Roga can be compared to the voice impairment of Hansen's disease caused by Mycobacterium leprae. Therefore, The Krimi described in Urdhwajatrugata Roga may be correlated to the visible Maggot or Larvae and the infectious microorganisms, which causes pathological damage to the body.

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