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A Scrutiny on *Keeta Visha* with Advertence to *Paederus Dermatitis*

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Abstract: ***Paederus dermatitis (PD) is a true irritant contact dermatitis of seasonal variability. It has worldwide distribution but is mostly reported from areas with hot tropical climate usually at the onset of rain. Paederus beetles are a member of the Staphylinidae family. Paederus melampus is the most prevalent species of Peaderus to be found in India. The contact with these insects affects the exposed site of body such as extremities, face and neck. The beetles are nocturnal by nature and drawn to artificial lighting, they are primarily found in densely populated areas like dormitories and apartments. The accidental brushing or crushing of the female insect against the skin leads to release of its coelomic fluid causing a peculiar irritant contact dermatitis with symptoms like itching, burning sensation, redness, blister formation and kissing lesions. These symptoms need to be timely managed and hence an effective method of treatment is a need. This beetle can be included under the groups of Keetas based on the symptoms it exhibits. In Agadatantra, Keetavisha is described under JangamaVisha. Hence an attempt is made to review Paederus dermatitis and Keetavisha.***

Keywords: *Paederus dermatitis*, *KeetaVisha*, Paederus insect

1. Introduction

Insects are the largest group of animals which constitute 75% of all living animals. An update from the global burden of disease study 2013 states that skin disease contributed 1.79%to the global burden of disease and skin diseases continue to be the 4th leading cause of non - fatal disease burden worldwide.

The fact that beetles cause blisters on the skin has been known since olden days. The problem of dermatitis is a common problem that can be seen worldwide. *Paederus Dermatitis* is a kind of dermatitis is caused by a poisonous insect. [1, 2, 3] It is also called as Dermatitis Linearis or blister beetle dermatitis. The problematic causative insect that causes *Paederus dermatitis* is Paederus insect.

Beetles of the genus Paederus belong to the family Staphylinidae [3, 4]. The common species of Peaderus seen in India is *Paederus melampus* [2 - 5]. The contact with these insects affects the exposed site of body such as extremities, face and neck. The skin problem is usually observed after awakening in the morning.

The beetles are small (size <1 cm), not able to run or fly, nocturnally active, positively phototactic they are found mostly in thickly populated regions like hostels, flats etc.

Structure consists of a black head, red thorax, upper abdomen, lower abdomen, and an elytral. Elytral is the structure that covers the wings and first three abdominal segments of the beetle [1 - 9]. These beetles feed on debris and live in moist habitats. Eggs are laid singly and develop to form larvae and adults in 3–19 days. [2 - 3]

This beetle does not bite or sting but brushing or crushing the beetle over the skin release extremely vesicating cytotoxin named Pederin. It penetrates the intact human skin which turns red with a burning sensation and the first clinical signs appear only about 12 - 24 hours.

In *Agada Tantra Keetavisha* is described under *Jangama Visha* and is considered as an *AganthujaNidana.*

Acharya Charaka has mentioned two type of *Keetas* such as *Dushivisha Keetas* and *Pranahara Keetas*. [6]*AcharyaSusruta* explains 67 varieties of *Keeta* under 4 groups [7]. This beetle can be included under the groups of *Keetas* based on the symptoms it exhibits.

Keetavisha is classified into *Teekshna* and *Manda* according to the severity of symptoms. Diagnosis and treatment of *KeetaVisha* according to its variety is found to be very difficult due to improper identification and regional variations. *Acharya Vagbhata* have classified whole of them as *Vataja, Pittaja, Kaphaja* and *Tridoshaja* and explained the general symptoms and treatments. [6 - 8]

Aim and Objectives:

- To study about types of *Keetas* described in our *Ayurvedic* texts.
- To study about *Paederus dermatitis.*
- To evaluate and discuss about *KeetaVisha* and their sign, symptom, effect on body.

2. Material and Method

The study on *KeetaVisha*and*Paederus dermatitis* and their effects were done with the help of classical*Ayurvedic* and other contemporary literatures and summarised data of different modern books and review articles.

3. Conceptual Study

Review on *KeetaVisha*

Types of Insects (*Keetas)*

Table 1: Types of Keetas

Slno	*Acharya Charaka* [14]	*Acharya Susrutha* [15]		*Acharya Vagbhatta (AH & AS)*
1	*DooshiVishaja*	*Vataja* - 18Types	*MandaVishaKeeta*	*VatajaKeeta/ VayavyaKeeta*
2	*Pranahara*	*Pittaja*or *Agneya* - 24 Types	*TeekshnaVishaKeeta*	*PittajaKeeta/ AgneyaKeeta*
3	-	*Kaphaja*or *Soumya* - 13 Types		*KaphajaKeeta / SoumyaKeeta*
4	-	*Sannipathaja* - 12 Types		*SannipathajaKeeta/SankeernaKeeta*

Pathophysiology of insect bite *(Sampraptho*f *KeetaVisha)* [6]

Visha (toxins) enter the *Shareera* (body) cause *Dooshana* (vitiation) of *Rakta Dhatu* there after *Kapha, Pitta* and *AnilaDoshas*and enter the *Hrudaya* (heart) and causes *Deha Chedana* (destruction of the body). In *KeetaVisha* the *Nidana*is mostly *Agantuja* (extrinsic*)* in nature and which vitiates the *Doshas* and causes various *Lakshanas*.

Signs and symptoms of insect bite *(Savisha Keeta Damsha Lakshana)*

Table 2: Showing *SavishaKeetaDamshaLakshana*

Kandu (Itching)	*Ruk* (Pain)
*Toda (*Pain)	*Paka* (Suppuration)
Vaivarnya (Discoloration)	*Sopha* (Swelling)
Vidaha (Burning Sensation)	*Raga (*Redness)
Kleda (Exudations)	*Mandala (*Skin Lesions)
Upasoshana (Dryness)	*Karnika* (Ring Like Formations)

Line of treatment of Insect poisoning (*KeetaVisha)*
Treatments for the *KeetaVisha* are done based on their predominance of *Dosha.* Various*Yogas* for *Lepa, Dhooma, Seka, Sweda*etc external and other internal medications like *Gutika, Choorna, Lehya, Kashaya, and Pana*etc [8]

Review on *Paederus Dermatitis*

About the causative insect: Acid Fly/ Paederus Insect/Blister Beetle
Scientific classification
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Coleptera
Family: Staphylinidae
Genus: Paederus
Species: *Paederus melampus* [5]

Synonyms
Blister beetle, Acid fly, Rove beetle, Manipal bug, Nairobi fly, MIT Bug, Nittae fly

Characteristic features of the insect
The insect consists of over 622 species which are distributed worldwide. The Paederus beetles have been associated with outbreaks of dermatitis in various countries including Srilanka, Africa, Australia, India etc [1 - 3]

They have
• Black head
• Lower abdomen
• Elytral (this structure covers the wings and first three abdominal segment)
• Red thorax
• Upper abdomen.

Paederus are nocturnal and attracted by incandescent and fluorescent lights as a result, inadvertently come into contact with humans. The beetles are more active from May to July months (before and after the onset of rainy season).

The toxic principle in genus Paederus is Pederin, Pseudopederin and Pedron. The Hemolymph of the beetle contains Paederin (latigaza) which is released on crushing of the insect onto the skin due to brushing away the insect. Paederin ($C_{25}H_{45}O_9N$) is an amide with two Tetrahydropyran rings and makes approximately 0.025% of insect's weight. The manufacture of Paederin is largely confined to adult female beetles. [5].

History of *Paederus dermatitis* [3]
Paederus dermatitis was first reported in the literature in 1901 by Vorderman, who reported an outbreak of dermatitis in personnel at the Anjet - Kidoel lighthouse in Jawa caused by insects that were known locally as semoet - kalong. The species described by Vorderman was *Paederus peregrinus*, believed to be a variety of *Paederus fuscipes.* [1 - 4]

Approximately 43 species of Paederus beetles were recorded in the Indian peninsula by Cameron in 1931. Neon and fluorescent light sources attract beetles. PD is known to be an entomological model of irritant contact dermatitis. In India, P. melampus is the species commonly causing PD.

Synonyms of *Paederus dermatitis*: *Paederus dermatitis* or blister beetle dermatitis or linear dermatitis or whiplash dermatitis or Nairobi fly dermatitis or acid fly dermatitis or rove beetle dermatitis or Staphylinidae dermatitis.

Paederus Dermatitis [12]
It is also called as Dermatitis Linearis/Blister Beetle Dermatitis. This has a worldwide distribution but more in hot tropical climate areas. The blister beetle dermatitis classically affects exposed sites of the body such as extremities, face and neck.

Signs and Symptoms
The signs appear 12 - 24 hours after the contact with the beetle.

Table 5: Signs and symptoms

Severe pain	Itching sensation
Blistering	Redness
Erythematous or oedematous plaque in linear fashion.	Kissing lesions/kissing ulcer - axillary, cubital and popliteal fossae
Burning sensation associated with or before the onset of lesion.	Erythema and desquamation in the face and upper body

The various morphological patterns encountered include

- Dermatitis linearis: It is the most common pattern. The lesions can occur at any site but more often occurs on exposed areas. They present as erythematous or linear streaky lesions
- Localized pustular dermatitis: It resembles an irritant contact dermatitis and presents as grouped pustules in the area of contact
- Kissing lesions: These occur due to contact of adjacent areas of the skin, often in the flexures such as the cubital fossa or axilla.

Criteria for Diagnosis of *Paederus Dermatitis*

Table 6: Criteria for diagnosis of PD

Major criteria	Minor criteria
• Vesicular eruption or necrotic lesions over the erythematous base in a linear distribution over exposed areas of body. • Burning sensation associated with or before the onset of lesions	• Kissing lesion over the flexure aspect of body. • Lesions noticed after awakening from sleep. • Seasonal variations (before and after the onset of rain) • Occurrences of cluster of similar cases in given area.

Histopathology

Early lesions show Neutrophilic Spongiosis leading to vesiculation and eventual reticular degeneration of the epidermis. This is followed by confluent epidermal necrosis, usually with a surviving layer of suprabasal cells.

The large number of intraepidermal neutrophils, combined with areas of confluent necrosis and reticular degeneration, are characteristics. Older lesions show irregular acanthosis and pallor of superficial keratinocytes, with overlying parakeratotic scale containing a Neutrophilicexudate [(3).]

In early vesicular stage, there are intraepidermal vesicles. The top of the vesicle is usually formed by the horny layer or by one or two rows of flattened cells. The floor consists of the basal cell layer and sometimes one or more strata of malpigian layer. Inside the vesicle there is fluid and a weft, formed by degenerated epithelial cells. The basal cell layer may be intact or indistinct and there may even be destruction of the Dermo - epidermal junction.

Complications [(1 - 5)]

Complications include post inflammatory hyperpigmentation, secondary infection and extensive exfoliating and ulcerating dermatitis.

Ocular and genital involvement is relatively common. It occurs secondary to transfer of the toxin chemical from elsewhere on the skin by fingers. However, ocular area may be the only site of involvement. Ocular involvement usually presents with unilateral Periorbital dermatitis or Keratoconjunctivitis which has been named as Nairobi eye.

Though PD is a clinical diagnosis at times it becomes difficult to identify it. Differential diagnosis of blister beetle dermatitis includes Herpes simplex, Herpes zoster, liquid burns, acute allergic or irritant contact dermatitis, millipede dermatitis and other dermatitis. [12]

Prevention [12]

Preventing human - beetle contact is the primary method of preventing Paederin - based trauma. Tactics that can be employed to achieve this include:

- Learn to recognize Paederus beetle and avoid handling or crushing these insects against exposed areas of skin.
- Keep doors closed and put screen on doors. Both doors and windows should be closed and ventilated properly to reduce the entry of beetles.
- A net or mesh can be tied under the light to prevent the beetle from dropping onto humans.
- Clear excess vegetation's from and around the residence as beetles may rest in these areas.

4. Discussion

An update from the global burden of disease study 2013 states that skin disease contributed 1.79% to the global burden of disease and continue to be the 4th leading cause of non - fatal disease burden worldwide. Although dermatitis is not communicable, it can cause discomfort and self - consciousness. Depending on the length of exposure and personal traits, different skin reactions are seen.

*Paederus dermatitis (*PD) is a peculiar irritant contact dermatitis characterised by sudden onset of erythema and lesions on exposed area. PD is provoked by an insect belonging to the genus Paederus. Despite having a global distribution, it is primarily reported from hot, tropical regions, usually just before and just after rain.

The unknown crushing of the female insect against the skin leads to release of its ceolomic fluid causing a peculiar irritant contact dermatitis with symptoms.

The Disease - *Paederus Dermatitis*

PDor blister beetle dermatitis or linear dermatitis or whiplash dermatitis or Nairobi fly dermatitis or acid fly dermatitis caused by Paederus insect.

Paederus are nocturnal and attracted in incandescent and fluorescent lights and as a result inadvertently come into contact with humans. Paederus beetle live in moist habitats and feed on debris. The weather changes like El –Nino phenomenon and changes in rainfall has been documented to alter the vegetation and support fly breeding.

They do not bite or sting but cause skin irritations and blisters when accidently brushed or crushed against the skin there by releasing their coelemic fluid. The active ingredient in the ceolomic fluid referred as paederin an amide ($C_{25}H_{45}O_9N$) which is the main culprit in producing the PD.

Paederin is weakly acidic and has been demonstrated in all developmental stages and in all parts of the adult insect except the wings. Paederin is the most complex non - proteinaceous insect secretion known and is produced only in female insects. Lesions are commonly noticed on awakening in the morning and hence it is known as "wake and see" disease in Nigeria and as "night burn" in Turkey.

The time delay between the first contact of skin with the toxin and the earliest erythematous lesion is known as the latent period. Exposed areas of the body such as the face, neck and arms are most affected, the palms and soles being spared.

Initial skin contact with paederin shows no immediate effects but within 12 - 36 hours reddish rashes, irritation, blistering, burning sensation like symptoms are produced.

KeetaVisha

Acharya Charaka has classified *Keetas*into two types: *DooshiVishaja&Pranahara*.

DooshiVishaKeeta causes *Rakta, Sita,* or *ShyavaPitika* along with *Kandu, Daha, Visarpa, Paka* (suppuration) and *Kuditha* (sloughing). *Paederus Dermatitis* also having the symptoms like redness, burning sensation, pain, swelling, lesions (kissing lesions, linear lesions etc), secretions. Hence *Paederus dermatitis* may be more related to*DooshivishaKeeta*. *Acharya Susrutha* and *Vagbhatta* also categorize*Keetas* and told their*Lakshnas* along with their treatment.

5. Conclusion

1) Insect bite reactions are commonly seen in clinical practice. *Paederus dermatitis* is a common condition in the presence of public awareness and with high index of suspicion.
2) The unintentional brushing of female insect against the skin usually at night release its coelomic fluid causing a peculiar irritant contact dermatitis with symptoms like itching, burning sensation, redness etc which were common in the exposed areas like face and other extremities.
3) *KeetaVisha* has been mentioned from *Vedic* period till date and have significant role in the manifestation of *Visha*.

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Figure 1: Insect - Paederus/Acid fly/Blister beetle

Figure 2: Periorbital involvement

Figure 3: Kissing Lesion

Figure 4: Linear lesions

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