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Incidence of *Paederus* Dermatitis Among Students of a Teaching Hospital, Jharkhand

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Abstract

A type of acute dermatitis, referred to as *Paederus* dermatitis, is caused by accidental or deliberate crushing of rove beetles, belonging to *Paederus* species. Crushing of these beetles leads to the discharge of haemolymph's chemical vesicant toxin, pederin on the skin, which leads to a skin lesion resembling skin burn. This present study is an exploration of outbreak of *Paederus* dermatitis among the undergraduate first and second year students of a teaching hospital in Hazaribag, Jharkhand. A total of 46 cases of suspected *Paederus* dermatitis were included in the study, extending from May to July 2015. The study evaluated and documented the clinical symptoms, environmental findings, and personal behaviour/habits of the cases to make way for the framing of precautionary measures. The study indicated that there were no significant (Chi-square test; $p = 0.8$) variation in the incidence of the observed skin lesion between males and females. The skin lesion in all the subjects was found to exhibit burn like appearance with erythema, non-uniform linear streaks and stinging sensation. Vesicles, pustules and crusts were found in 82.6% of the subjects. Kissing lesion was seen in 2.17 % of the subject. The skin lesion was especially noted in body parts that are generally kept exposed like face, neck and forearms. Potential risk factors for the dermatitis to name a few included modifiable factors like the windows without window screen, keeping lights on till late night attracting the beetles and lack of protective clothings during the outbreak. Taking care of these modifiable risk factors may reduce the risk of *Paederus* dermatitis. Topical steroidal creams, antihistamines and antibiotics may be used for the treatment of *Paederus* dermatitis under medical supervision.

Keywords: College students, Hazaribag, Jharkhand, *Paederus* dermatitis, skin lesion

Introduction

Beetles or Nairobi fly belonging to the genus *Paederus*, class Insecta, order Coleoptera, family Staphylinidae (rove beetles), subfamily Paederinae, tribe Paederini, and subtribe Paederina is responsible for causing *Paederus* Dermatitis worldwide^{1,2,3}. The other names for *Paederus* dermatitis are whiplash dermatitis/dermatitis linearis/Nairobi fly dermatitis. *Paederus* Dermatitis is a irritant contact dermatitis. The *Paederus* beetles also known as dragon bug does not bite/sting. When these beetles are unknowingly or deliberately crushed by the subject, haemolymph's toxic chemical, pederin is poured on the skin which results in the skin burn like lesions after a few hours or a day⁴. The pederin is an extremely potent amide present within the body fluids of the *Paederus* beetles. Two tetrahydropyran rings forms the Pederin (C₂₅H₄₅O₉N), which has the capacity to halt growth of cells in negligible concentrations of around 1.5 Nanograms per millilitre. The female beetles produce the pederin, the generation of which is due to the activities of *Pseudomonas* species, an endosymbiont found in the beetle^{5,6,7}. Discharge of epidermal proteases, disruption of intercellular connections, inhibition of mitosis, DNA synthesis and protein synthesis occurs due to the pederin^{8,9}. The toxicity of pederin is twelve times more in comparison to the venom of cobra¹⁰.

The *Paederus* beetle are seen mostly in the summer, spring and rainy season^{11,12}. The *Paederus* beetles have a slender body around 7–10 mm in length and 1.5 mm in width. The body is bicoloured, generally black and red/orange; warning colours of the beetle's toxicity. In the temperate, tropical and subtropical regions of the world about six hundred species of *Paederus* genus has been documented. *Paederus* beetle's harmful impact is comparatively newer to the Western medical world than the Chinese medical world. The Chines had known the *Paederus* beetles 1,200 years before the Westerners came to know about it. Johann Christian Fabricius (1745-1808), a Danish entomologist, is credited to be the first one to describe the *Paederus* beetles^{13,14}.

The teaching hospital situated, a little interior from the town of Hazaribag, Jharkhand encountered incidences of *Paederus* dermatitis in the year 2015. The present study was undertaken to evaluate the clinical manifestations and understand the potential risk factors contributing to the acute dermatitis outbreak in the said teaching hospital. So, that necessary precautions and suggestion can be given to prevent the dermatitis from occurring again in the future.

Materials and Methods

Design

A descriptive study on the incidence of *Paederus* Dermatitis was carried out among students. The study was undertaken by the Department of Physiology and Biochemistry of a teaching hospital located in Hazaribag, Jharkhand, from May to July 2015. Institutional Ethics Clearance and informed consent from the subjects were also obtained.

Sample

The participants of the study were the students of undergraduate course of the teaching hospital, studying in the first and second year. A total of 46 subjects who were suspected to have a lesion due to *Paederus* beetle were included in the study after careful history taking and examination of the lesion. The cases were confirmed clinically by the presence of acute skin lesions such as erythema, blisters, vesicles, kissing lesion, burning sensations and spotting of *Paederus* sp. within the institute campus.

Data Collection

For the purpose of data collection, a face to face interview was arranged with the subjects reporting skin lesion. The interview was focused around gathering participant's basic characteristics (age and sex), nature and clinical symptoms of the acute skin problem including site of the dermatitis and features of the skin lesion, potential risk factors : environmental (window or door close to farmland, sighting of rotten leaves, insects, and usage of window screens) and personal habits - clothing (long sleeved or half sleeved dress/shirts, long or short trousers), usage of bed nets, windows closed or open during night, usage of pesticides/ insect repellents, and light usage behaviour of the subjects. These risk factors for the *Paederus* dermatitis were identified on the basis of pervious studies ^{4,15,16}.

Data Collection

The data collected were analysed using frequency or percentage and Chi-square test when necessary. The p value of < 0.05 was taken to be significant.

Results

The specimen of *Paederus* sp. beetles collected from the institute campus is shown in **Figure 1**. These beetles are thought to be responsible for the skin lesions in the present study.



Figure 1: *Paederus* sp., Hazaribag, 2015

Study Participants basic characteristics

The mean age of the subjects studied ranged from 19-23 years, with a mean of 21.11 ± 2.25 . The subjects were either in the first or second year of their study.

Out of the 46 cases of *Paederus* dermatitis studied, 24 (52.1%) were males and 22 (47.7%) were females. The difference was not significant (chi square test; $p = 0.8$).

Skin lesion-clinical symptoms findings

All the 46 subjects were symptomatic with skin lesions appearing like skin burn. Erythema, a smudge or irregular linear streaks, and burning/ stinging sensation was noted in all the subjects. Vesicles, blisters, pustules and crusts were seen in 38 (82.6%) subjects with negligible or no pain. Oedema were evident in 2 (4.34%) subjects. A total of 8 (17.4%) subjects reported after a week or so after getting in contact with the beetle showed transient postinflammatory hyperpigmentation.

The most commonly affected sites were in both the genders were face (41.2 %), neck (30.2%), forearm (24 %) and legs (6.02%).

Greater than one affected site was seen in 22 (47.82 %) subjects, only 1 (2.17 %) subject exhibited kissing lesion.

Ocular involvement or periorbital dermatitis referred as Nairobi eye was not seen in any of the cases.

The pictures of some of the cases seen in the present study is shown below-



Figure 2 : Skin lesion in neck region,
Hazaribag, 2015



Figure 3 : Kissing lesion in
folds of upper arm,
Hazaribag, 2015

Environmental findings

All the 46 subjects stayed in the hostel and were having either a window or door close to farmland or vegetation. All of them kept the window panes open during sleep, and all of them sighted rotten leaves.

Twenty nine (63.04 %) subjects did not sight any insects in their room or vicinity. 17 (36.9 %) subjects sighted some ant like insects on the ceiling of their room or on objects within the room.

All of them reported lack of window screens.

Personal habits of cases

Of the 46 subjects studied, 24 (52.17 %) subjects had the habit of avoiding long sleeved dress or long trousers during sleep, 18 (39.1 %) subjects used bed nets, 40 (86.9%) of the subjects slept with windows open for the night, 15 (32.6 %) subjects at irregular intervals used pesticides/insect repellents in their room, and 39 (84.8 %) subjects had the habit to keep their room lights on after 10 pm.

Discussion

Most of the schools/colleges/educational institutions are built closer to farmland/ forests/dense vegetation areas which are the natural residence for the *Paederus* beetles. Hence, it has likely that these beetles may get into hostels or residential areas and may cause an outbreak of *Paederus* dermatitis. Similar event has been documented by the present study in a teaching hospital of Hazaribag during May-July 2015 where the students were affected with skin lesion of *Paederus* dermatitis. In the present study, insignificant (Chi square test; $p = 0.8$) variation in the incidence of the dermatitis was observed between males and females, implying that both males and females students were exposed to similar potential risk factors- environmental and possibly behavioural. This is expected because all of them were staying in the hostel, which was situated within 1 km of crop fields in agricultural landscapes. In all the subjects lesion looking like skin burn were found at the exposed skin surfaces¹⁷ like the face, neck and forearm. Similar results have been reported earlier in India^{1,18} and elsewhere¹⁹. Nairobi eye was not seen in the present study. However, studies on other population have found it^{1,20}. The incidence of kissing lesion was lowest compared to other skin lesion in the present study. This was in line to earlier studies^{1,21}. The kissing lesion happens when the affected skin rubs over other skin areas as in the axilla, flexure of elbow and others. The skin lesions usually heal within a duration of one to three weeks, leaving a transient postinflammatory hyperpigmentation⁸.

Investigation of possible environmental and behavioural risk factors for the *Paederus* dermatitis revealed that all the subjects had window panes open, and windows were without window screen that is not advisable. This allowed easy entry of the beetles to the inside of the room from the agricultural fields, attracted by the fluorescent lighting of the room. Hence, it is advised that windows should not be left open with such lights glowing. Artificial lights attract these beetles into human dwellings from their natural sites²². Usage of protective measures such as use of bed nets, appropriate pesticides or insect repellents and wearing of protective full sleeved clothes were also missing among some of the students. This was most probably due to lack of knowledge about the causal agent of the skin lesion. The students might have remained ignorant about the beetles and the protective measures required to stop them from becoming troublesome. A section of students due to lack of awareness even on sighting some ant like insects in their room did not take any precautions. This definitely pointed out the necessity of raising awareness about *Paederus* dermatitis among students.

Based on the findings of the present study, there appears to be a number of modifiable factors for the *Paederus* dermatitis and the following may be said - decreasing the number of artificial lights, switching off the lights early or before sleeping, environmental sanitation may reduce the incidence of *Paederus* dermatitis. Closing of window panes before sleeping, or at least use of windscreens is recommended. To decrease the susceptibility to dermatitis, body parts may be covered with light full sleeved dress during the seasons of increased activity of the *Paederus* beetles. It is recommended beetles that land on the skin must be removed by gently blowing air through the mouth and should not be crushed or touched. On skin

contact with the beetle, the skin surface should be washed with soap and water. One should not touch eyes after touching the beetles. Some other measures that may be protective includes the following – screening of doors, avoiding sitting under light with windows open, mesh/net tied below the light will restrict the *Paederus* beetles from falling onto humans, stoppage of mobile usage after switching off lights to stop the beetle from falling on to the eyes or face, clearing of the bedsheets and flicking them before laying, use of bed nets, clearance of unwanted vegetations and decaying matters from the campus area.

Though the skin lesions are considered self-healing²³, for good recovery, medical treatment of *Paederus* dermatitis may be required. The treatment is done using topical steroids, fusidic acid, antibiotics like ciprofloxacin, and other drugs (**Figure 4**) under the guidance of medical experts. *Paederus* dermatitis may sometime lead to fever, vomiting, arthralgia and neuralgia, necessitating medical attention¹⁶.

The findings of the present study suggested that the awareness regarding the condition and its protective measures should be promoted among subjects living close to farmland and forests.

Paederus dermatitis clinically resembles herpes simplex, chemical burns, herpes zoster, irritant contact dermatitis, phytophotodermatitis and allergic skin conditions¹⁶. Hence, the early recognition of symptoms is the key to proper treatment and avoidance of complications of the dermatitis. Misdiagnosis by physicians may be prevented by taking into consideration the environmental surrounding of the subject suffering from the dermatitis.

Supposedly, this is the first documented report of *Paederus* dermatitis from Hazaribag, Jharkhand to the best of our knowledge. The findings of the present study will be helpful to formulate strategies for prevention of *Paederus* dermatitis.

Limitations

The entomological identification of the species of *Paederus* beetles causing the dermatitis was not done. The study included only the undergraduate first and second year students. Other class students, faculty members and other staffs were not included due to time constraint and hence a holistic picture of the outbreak was not obtained by the study.

Authors' Contribution

Conception, design: RK and RM; Data collection, Analysis, interpreting the data, statistical expertise and drafting: RM; Critical revision of the article for important intellectual content, final approval of the article and provision of study materials : RK and RM.

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Conflict of Interest: None.

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Additional Images



Figure: 4