Original Article

Bugs don't Bite to do Damage: A Study of Nairobi Eye in the Democratic Republic of the Congo

V K Baranwal[1], Ranjit Goenka[2], R P Gupta[3], Ashok Kumar[4], Vikas Ambiya[4]

[1]Commandant, Military Hospital Jhansi, Uttar Pradesh, India, [2]Department of Ophthalmology, Military Hospital Kirkee, Pune, Maharashtra, India, [3]Principal, MIMER Medical College, Talegaon Dabhade, Pune, Maharashtra, India, [4]Department of Ophthalmology, Base Hospital Delhi Cantt, New Delhi, India

ABSTRACT

Aim: We report our experience and results of the only study ever carried out in the world, regarding managing outbreaks of Nairobi eye in the Democratic Republic of the Congo (DRC). **Materials and Methods:** This prospective study was conducted over 4 years from April 2008 to May 2012 at the United Nations (UN) Hospital located in the DRC. After a detailed history and examination, treatment was initiated and all patients were followed up until complete recovery. **Results:** 49 (15.7%) out of a total of 312 cases of *Paederus* dermatitis suffered from Nairobi eye. 37 (75.5%) were male and 12 (24.5%) were females. The age of the patients ranged from 3 to 78 years. No significant difference was observed on the basis of gender, race, or nationality. Burning sensation was the major symptom. The average duration of symptoms and loss of person-hours was 7 days and 72 h, respectively. The most common papular lesions were seen in 20 (40.8%) cases. 5 (10.2%) cases who presented with pre-septal orbital cellulitis needed systemic antibiotics and steroids. Dyschromia was seen in 6 (12.4%) cases. The overall healing time in majority of patients (31, 63.3%) was 7–14 days. **Conclusion:** Awareness of Nairobi eye and simple preventive measures, timely diagnosis, appropriate treatment, and follow-up are very essential in decreasing the suffering, loss of person-hours and complications from the illness. As the DRC has a significant presence of the UN troops including Indians, essential features of this study should be incorporated as an advisory for them to prevent as well treat this disease if needed.

Key words: Nairobi eye, *Paederus dermatitis*, UN troops

INTRODUCTION

"Nairobi eye" is a condition of severe dermatitis with eye involvement arising when beetles of genus *Paederus* are crushed against the exposed skin.[1] *Paederus* species belongs to insect order *Coleoptera* (i.e., beetles) and family *Staphylinidae*. Over 600 species of genus *Paederus* have been described. It is distributed in all continents except Antarctica.[2] Outbreaks of *Paederus* dermatitis are common in Africa, South America, and Asia.[2-6] The species of beetles common in East and Central Africa are *Paederus fuscipes*, *Paederus sabaeus*, and *Paederus crebrepunctatus*. Locally, they are called "Ekonda (Lingala)" or "Nairobi Fly." The species encountered commonly in Goma, a city in the Eastern part of Democratic Republic of the Congo (DRC) is *P. fuscilis*. Adults are 7–10 mm long, are 0.5–1 mm wide, and have a black head, lower abdomen and elytra (this structure covers the wings and first three abdominal segments), and a red thorax and upper abdomen.[2,5] They live

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Address for correspondence:
Dr. Ranjit Goenka, Department of Ophthalmology, Military Hospital Kirkee, Pune, Maharashtra, India.
Mobile: +91-7042090102. E-mail: ranjitgoenka@gmail.com

in moist habitats and are more active in daylight. However, adults are attracted to neon and fluorescent light more than incandescent bulbs. They have short wings but can fly short distances. They enter rooms and tents attracted by light and move around on the walls and floor. They usually do not fly within the rooms and come into accidental contact with humans when crushed or killed.[2] Eggs are laid singly on moist substances and take 3–19 days to develop into larva and adults.[2] Pederin production is largely confined to adult female beetles. Larva and males mainly store pederin acquired maternally or by ingestion.[7] Pederin is a toxic amide and a potent vesicant and makes up to 0.025% of insect's weight. It is contained in the hemolymph of the beetle. Production of pederin relies on the activities of an endosymbiont (*Pseudomonas* species) with *Paederus*. Pederin is more poisonous than even the cobra snake venom on a weight for weight basis. A dead *Paederus* is as dangerous, if not more so, than a live one because it is more likely that its body fluids come into contact with humans and its toxin is potent even after its death. The *Paederus* insect does not bite or sting, but its accidental brushing or crushing over the skin leads to release of pederin. No human is immune to "pederin" if there is a contact with the toxin. The resultant irritant contact dermatitis is characterized by erythematous and bullous lesions on the skin. The toxin, pederin, does not affect the skin of palms and soles;[2] dermatitis occurs when palms and soles contaminated with the toxin inadvertently come into contact with the other body parts, though dermatitis itself is not transferable.[8]

The eye reaction in *Paederus* dermatitis is called "Nairobi eye." It is in the form of periorbital dermatitis and keratoconjunctivitis. In mild cases, slight erythema occurs after 24 h of contact and lasts for 48 h. In moderate cases, marked erythema that starts 24 h after contact is followed by a vesicular stage after about 48 h. Subsequently, after about 8 days, exfoliation occurs in the squamous stage. The resulting dyschromia persists for about a month. Severe cases in addition to the extensive features of moderate cases can have additional symptoms such as nausea, fever, arthralgia, vomiting, neuralgia, prostration, joint pains, swelling, and inability to move the affected part. Erythema in these severe cases may persist for many months. A striking feature is "kissing lesions" that occurs whenever apposition of damaged areas to previously intact skin takes place as occurs in flexures of elbow, knee, and thigh. However, kissing lesions are not seen in Nairobi's eye. Complications include secondary infections, post-inflammatory hyperpigmentation, extensive exfoliation, and ulcerating dermatitis.[2,8,9] There is a debate as to the best approach to treatment. The various methods suggested include initial washing with soap and water for 5–10 min, topical steroids, topical antibiotics, dressing, clearing adherent crusts.[10]

The occurrence of these painful lesions, especially around the eyes, leads to significant morbidity and loss of working hours. We report our experience in managing outbreaks of *Paederus* dermatitis affecting the eyes and the surrounding periocular regions (Nairobi eye) in the DRC. This, to the best of our knowledge, is the only study ever carried out in the world on the Nairobi eye.

MATERIALS AND METHODS

This was a prospective observational study and was conducted over 4 years from April 2008 to May 2012 at the United Nations (UN) Level III Hospital, located at Goma, in the DRC in Africa. The patients included military personnel, civilian staff of UN, and various non-government organizations as well as the local population. Hence, they belonged to several different nationalities. A detailed history was taken in all cases including age, sex, past episodes of similar skin lesions, and lighting used (fluorescent or incandescent). Patients with a previous history of chronic skin disease or allergy were excluded from the study. Thorough ocular, dermatological, and systemic examination was done to determine the site of involvement, morphology of lesions, pattern of lesions, residual post-inflammatory pigmentary changes (hypo- or hyper-pigmentation). Treatment was then initiated, and all patients were examined and followed up until complete healing occurred.

RESULTS

Of total of 312 clinically diagnosed cases of *Paederus* contact dermatitis, 49 (15.7%) suffered from periorbital

Table 1: Location of *Paederus* dermatitis (*n*=312)

Location of dermatitis	Number (%) of cases
Eye and periocular region	49 (15.7)
Head (except eye and periocular region)	116 (37.1)
Neck	80 (25.6)
Trunk	47 (15)
Groin	19 (6)
Upper extremities	63 (20.1)
Lower extremities	41 (13.1)

Many cases had multiple site involvement

dermatitis and keratoconjunctivitis (Nairobi eye) [Table 1]. 37 (75.5%) were males and 12 (24.5%) were females. The age of the patients ranged from 3 to 78 years. Majority of cases (42, 85.7%) were reported between October 2008 and February 2009. Fluorescent lights were used at night by 32 (65.3%) of the patients. No significant difference was observed in either the clinical features or therapeutic outcomes on the basis of gender, race, or nationality.

The most common papular lesions were seen in 20 (40.8%) cases [Table 2]. Macules, vesicles, pustules, exfoliation, and pigmentation were also common [Figures 1-3]. Kissing lesions not observed in the periocular region were seen elsewhere in 3 cases. Burning sensation (39, 79.6%), itching (25, 51%), and pain (26, 53.1%) were the major symptoms [Table 3]. The average duration of symptoms was 7 days. Average person-hours lost due to the disease were 72 h due to severity of symptoms. Post-inflammatory hyper- and hypo-pigmentation were seen in 2 (4.2%) and 4 (8.2%) cases, respectively [Table 4 and Figure 4]. Pre-septal orbital cellulitis was seen in 5 (10.2%) cases [Figure 5]. Linear and bizarre patterns of distribution of lesions were the most common types of dermatitis in 21 (42.9%) and 14 (28.6%), respectively [Table 5]. In almost all cases, skin lesions were first noticed in the morning with itching and burning sensations. This

Table 2: Morphological pattern of dermatitis (*n*=49)

Morphology of lesions	Number (% of cases)
Macula	5 (10.2)
Papule	20(40.8)
Vesicle	10 (20.4)
Pustule	7 (14.3)
Exfoliation	11 (22.45)
Pigmentation	6 (12.2)

Many cases had multiple types of lesions

Table 3: Major symptoms in a case of *Paederus* dermatitis (*n*=49)

Symptom	Number (%) of cases
Burning sensation	39 (79.6)
Itching	25 (51)
Malaise	11 (22.4)
Fever	7 (14.3)
Pain	26 (53.1)
Asymptomatic	3 (6.1)

Many cases had multiple symptoms

Table 4: Residual dyschromia after healing (*n*=78)

Type of dyschromia	Number (%) of cases
Hypopigmentation	4 (8.2)
Hyperpigmentation	2 (4.1)

Figure 1: Erythema seen in mild dermatitis stage of Nairobi eye

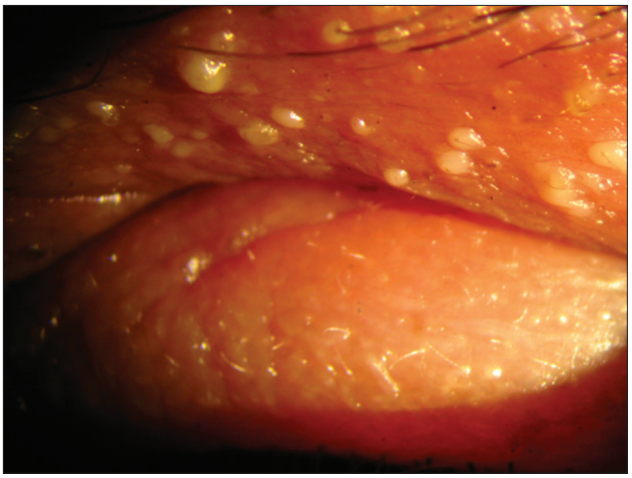

Figure 2: Vesicle and exfoliation seen in moderate dermatitis stage of Nairobi eye

Figure 3: Squamous exfoliation stage of Nairobi eye

Figure 4: Hyperpigmentation stage

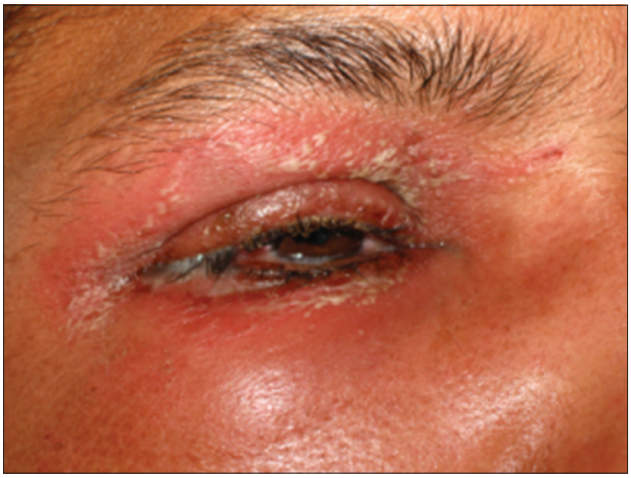

Figure 5: Pre-septal orbital cellulitis

was followed by vesicle formation in 1–2 days. They ruptured over 1–2 days forming erosions or crusting or developing secondary infection. The overall healing time in majority of patients (31, 63.3%) was 7–14 days [Table 6]. 5 (10.2%) cases who presented with pre-septal orbital cellulitis needed systemic steroids in addition to systemic antibiotics. Scarring was not seen in any patient. No patient had loss of visual acuity due to disease or any long-term ocular complications.

DISCUSSION

Nairobi eye is caused by a vesicant chemical contained in the body fluid of *Paederus* species. Ours is the only study done till now exclusively about Nairobi eye.

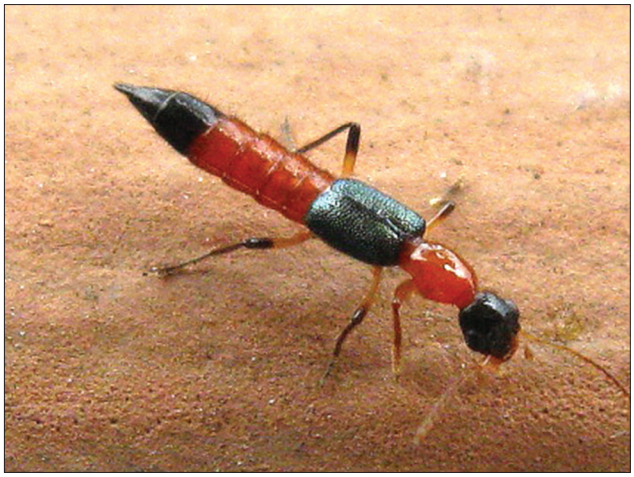

Figure 6: Photograph of *Paederus fuscipes*

The results have therefore been compared with other studies from whatever data could be inferred about Nairobi eye in those studies. The age of the patients ranged from 3 to 78 years in our study as compared to 22–42 years in Sierra Leone study.[2] All our patients had some or the other symptom, unlike Sierra Leone study where 20% were asymptomatic.[2] Pain was a common symptom noted in 53.1% of cases in our patients unlike no pain in any patient in the Sierra Leone study.[2] Facial lesions had predilection for the periorbital region as in the Iranian study[11] and Sierra Leone study.[2] Eyes were the most commonly involved site in our study though in greater number than as reported by the Iranian study,[11] the Sierra Leone study,[2] and Indian study.[12] Pre-septal orbital cellulitis common in our study has not been reported by other studies. The more common and severe symptoms and signs seen in our patients ARE most probably due to the more potent toxin produced by the *P. fuscilis* species prevalent in this part of the world as compared to the Sierra Leone species *P. sabaeus* Erichson[2] and Iranian species *Paederus* Ilsac Bernhardt and *Paederus* iliensis Coiffait[5] [Figure 6]. This may also be the reason for the longer healing time taken by the patients in our study. Scarring was not seen in any of the cases as in Iranian[5] and Sierra Leone studies.[2] We feel that it is due to the prompt and appropriate treatment and follow-up until the patients recovered completely. While many patients complain of symptoms from the time of contact with the *Paederus*, reactions are often delayed for up to 24 h. The insensitivity of hands and feet to pederin and delay in reaction makes inadvertent transfer of pederin to other parts of body especially periocular region after contact with *Paederus* species. Although

Table 5: Distribution pattern of *Paederus* dermatitis (*n*=49)

Pattern of distribution of dermatitis	Number (%) of cases
Linear	21 (42.9)
Bizarre	14 (28.6)
Herpetiform	9 (18.3)
Annular	5 (10.2)

Table 6: Healing time (*n*=78)

Healing time (days)	Number (%) of cases
<7	6 (12.2)
7–14	31 (63.3)
15–21	7 (14.3)
>21	5 (10.2)

rarely fatal, an outbreak of *Paederus* dermatitis has often forced people to migrate to safer areas. Various preventive measures have been suggested by Singh and Ali.[13] Simple preventive measures include learning to recognize the *Paederus* beetle and avoiding handling or crushing *Paederus* beetles against the skin. Screening on doors and windows, sleeping under bed net, and removing/killing beetles by insecticides are also helpful in preventing Nairobi eye. Washing of suspected body area of contact with *Paederus* with soap and water for 5–10 min is highly effective in decreasing the morbidity of *Paederus* dermatitis. Beetles are attracted to light especially fluorescent light. It is advised to change light source from fluorescent to incandescent as *Paederus* do not seem to be attracted to yellow incandescent lights. Remember that beetles can cause symptoms whether dead or alive, so avoid handling beetles directly and if possible wash skin, clothing, and equipment that may have been exposed to beetles. It is best to seal beetle carcasses in a plastic bag before placing in garbage. There is a debate on the best approach to treatment. However, most of our patients responded well to topical steroids and topical antibiotics after initial washing with soap and water.[5] Cases that had pre-septal orbital cellulitis in our study were treated successfully with systemic antibiotics and steroids in addition to local treatment. The person-hours lost due to morbidity of the disease is significant. Proper sensitization of the troops about the disease, timely evaluation and diagnosis, and management can reduce loss of a valuable resource in a war-torn country.

CONCLUSION

Nairobi eye is much more common in the DRC as compared to other parts of the world most probably due to the presence of *P. fuscilis* variety of *Paederus* having more potent pederin toxin. It equally affects people of all nationalities, race, and gender as observed in our study. No age is exempt from the disease. Awareness of condition and simple preventive measures are vital in reducing the morbidity from illness. Timely diagnosis, appropriate treatment, and follow-up are very essential to decrease suffering and complications from the illness. It is needless to say that though most of the cases of *Paederus* dermatitis are managed successfully by the dermatologists; however, we recommend that an ophthalmological consultation must be sought in all cases of Nairobi eye. As the DRC has a significant presence of UN troops including Indians, essential features of this study should be incorporated as an advisory for them to prevent as well timely treat this disease if needed.

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