Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2016; 4(2B):460-468 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2016.v04i02.030

Original Research Article

Investigation of Blister Beetle (Lytta vesicatoria) Dermatitis Outbreak and Containment at Kwara State University Students' Hostels

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Abstract: The study was undertaken to ascertain the causative agent and diagnosis of the clinical profile of patients that made them susceptible to Blister Beetle Dermatitis, efforts were also devoted to investigate risk factors associated with BBD symptoms in patients. This study also provides entomological and environmental data on occurrence and outbreak of BBD at the student hostels in Kwara State University, Nigeria. Patients with clinical manifestation of dermatitis were studied by questionnaire administration along with close clinical examination of the disease condition. The questionnaire sought information on skin lesions, sleeping locations of the patients and beetle activity. The result of the study revealed 44 patients (30 males and 14 females) reported insect bite, dermatitis at and were treated for BBD at the University Medical Centre. The majority of patients were in the age group 10-25years, (77.3%). Thirty four (77.3%) resides in the hostels of the university while others live outside. The commonest body locations affected was the neck (40.9%) and head and face (27.3%). Majority of the cases were reported in October (83%), September (7.8%) and August (2.4%) which coincided with both rainy period and high prevalence of blister beetles collection at the study area. Mean duration of the symptoms manifestation were 3 to 5 days. Fitting houses with good insect screens, light-proof curtains, yellow light bulb and immediate washing of area of contact of beetle on body with soap and water are parts of the precautionary measures proffered.
Keywords: Blister beetle, control, dermatitis, season, outbreak.

INTRODUCTION

Adults of meloid beetles belong to the phylum Arthropoda, class Insecta, order Coleoptera and have been widely reported as being of medical importance. Eighteen meloid species have been reported as important agents causing blistering in humans [1, 2, 3]. Different species of Mylabris, Lytta and Epicauta are responsible for many cases of human dermal blisters and dermatitis [4].

The 'true blister beetles' Lytta vesicatoria primarily occur in arid, sub-tropical and tropical savannas. Adults are soft-bodied, long-legged beetles with bright or dark colouration ranging from army green, bluish or blackish [5-8].

Adult Lytta vesicatoria releases oily droplets of haemolymph from their leg, antennal or abdominal joints when disturbed. This exudation contains toxic material referred to as 'cantharidin' and causes human skin lesions. Human dermatitis occurs when human come in contact with the beetles of the three major families -Meloidae, Oedemeridae and Staphylinidae [9-11].

In Africa, Meloidae, Staphylinidae, Tenebrionidae and Dermestidae families are responsible for most of the human health complaints [12, 13]. The commonest symptoms observed are skin lesions produced when the active ingredient cantharidin is released by the beetle when it is crushed or rubbed upon the exposed skin. Cantharidin have been reported to cause severe skin blisters, particularly when the insects discharge or get crushed on the human body [14-17]. Other blister beetle of widely reported health significance is Paederus beetle known and called by different names in different regions ('skirt and blouse', 'blister beetle', 'electric insect' or rove beetle[18, 19].

The blister beetle is prevalent in many countries and commonly found in marshes, paddy fields

and in school hostels close to vegetation in tropical and temperate climates[20, 21].

Although many medically important beetles are present in West Africa, however, only few reports are available in literature on the health impacts of these beetles on the local population particularly in Kwara State, North-Central, Nigeria. This study therefore focused on prevalence and first experienced outbreak of blister beetle dermatitis during September and October 2015 at the Kwara State University, Malete hostels.

The current study was designed with the following objectives:

i. To ascertain the causative agent of the current episode of human dermatitis on students and staff of Kwara State University Malete,
ii. Conduct diagnosis and clinical examination on patients presenting with symptoms of acute uncomplicated dermatitis caused by Blister Beetle attack.
iii. Provide entomological and environmental data on prevalence of Blister Beetle Dermatitis(BBD);
iv. Recommend management tactics for Blister beetle and dermatitis condition.

MATERIALS AND METHODS

Study area

The study was carried out in Kwara State University (KWASU) Malete environs, in Moro Local Government Area, North-Central geo-ecological zone, Kwara State, Nigeria. Malete is situated at Longitude 8°42'0" N and Latitude 4°28'0" E. The State is located in the tropical zone of North-Central Nigeria with a land area of 36,825 square kilometers and a population of 2,591,555 (Unpublished report, Ministry of Health, 2005). The area experiences two seasons, Tropical wet and dry climate. Both seasons last for about six months. Kwara State is a rainfall area, with an annual rainfall range of 1000 mm to 1500 mm with the mean annual rainfall at about 107.3mm. The dry season is from October to March and the wet season is from March to September Keay, 1953; Ogunwale, Olaniyan, and Aduloju, 1999) [22, 23]. Temperature is uniformly high and ranges between 25°C and 30°C in the wet season throughout the season except in July – August when the cloud of the sky prevents direct heatstroke while in the dry season it ranges between 33°C to 34°C. The annual temperature range is from 22.8 °C to 34.9°C [24, 25].

Sampling Techniques and data collection

Clinical study

A clinical study was carried out on patients that presented symptoms of acute uncomplicated infection at the University Medical Centre, Environmental Safety Unit and other health clinics at the study area. Other insects' bites and stings presenting similar symptoms were studied on clinical grounds and the clinical details of all the patients were recorded. Also structured questionnaire was employed to extract information from affected patients on types and location of skin lesions; sleeping areas and their proximity to light source, vegetation and contact with the beetles, relationship to night and the month of occurrence were documented.

Collection of Entomological and Environmental data and identification of skin Blister Causative Agent (BCA)

To ascertain the identity of the causative agent of the blister beetle dermatitis and obtain entomological and environmental data, beetle species from vegetation attracted to bright lights after nightfall was collected from KWASU student hostels (on and off-campuses) and academic areas. This was done for a period of three months (September-November 2015) during night hours (7:00 pm to 10:00 pm) fortnightly for the period of the outbreak. The species were identified and monthly average values calculated.

RESULTS

Clinical study

The result of the demographic profile and clinical study presented in Table 1 revealed that forty-four (44) patients made up of 30 males(68.1%) and 14 females(31.8%) affected by blister beetle partook in the study. The majority of the patients 34 (77.3%) were in the age group 10-25years, forty-one (93.2%) were literate and more than two-third of the respondents were male students of the University. The commonest sites of the body affected were the Neck (40.9%) followed by head and face (27.3%), Trunk and Lower limbs both (13.6%) and hand (4.5%). The mean duration of the symptoms and treatments obtained were between 3 to 5 days.

Table 1: Socio- demographic profile of respondents at the study area (N=44)

Variables	N	%
Age		
10-25	34	77.3
26-35	10	22.7
36-45	0	0
46>	0	0
Education		
Literate	41	93.2
Illiterate	03	6.8
Occupation		
Student	32	72.7
Staff	04	9.1
Others	08	18.2
Sex		
Male	30	68.2
Female	14	31.8
Signs and symptoms		
Acute condition	12	27.3
Sub-acute condition	32	72.7
Causative agent		
True blister beetle(Lytta servicatoria)	43	97.7
Paederus blister beetle(Paederus rufiscipes)	0	
Not sure	01	2.3
Lesion site		
Head and face	12	27.3
Neck	18	40.9
Hand	02	4.5
Trunk	06	13.6
Lower limb	06	13.6
Treatment period in days		
1-2	10	22.7
3-5	30	68.2
>7	04	9.1

Source: Field survey, 2015

Table 2 presents the general occurrence of individuals affected by BBD and their residential areas. Majority of BBD patients are male students (68.2%) while females constitutes 31.8% and all were resident in the various hostels of the University. Four (9.1%) patients were recorded from Females General Hostel (FGH), eight (18.2%) from Lambo A and two (4.5%) from Agit 1.For the male hostels five (11.4%) were recorded from Bay Star Hostel (BSH), eight (18.2%) from Lambo Hostel B, seven (15.9%) from Agit 2 Hostel and three (6.8%) from Other Hostels. Most cases were reported in October, 30(68.2%) and September, 14(31.8 %).

Table 2: General occurrence of individuals affected by BBD and their respective residential areas

Variables	Females = 14			Males = 30			
	On-campus Hostels	**Off-campus hostels**		**On-campus hotels**	**Off-campus hostels**		**Others hostels**
	Female General hostel(FGH)	Lambo A hostels	Agit 1 hostels	Bay star hostel	Lambo B hostels	Agit 2 hostels	Others
Students	4	8	2	5	8	7	3
Staff	0	0	0	0	0	0	3
Others	0	0	0	0	0	0	4
Total	4	8	2	5	8	7	10

Source: Field survey, 2015

The result of number of blister beetle dermatitis reported cases during the period of outbreak is depicted in Table 3. Of the eleven cases reported in September, 1(2.3%) was recorded from on-campus hostels; Bay star hostel, 4 (9.1%) from Lambo 'A' and 'B', 2 (1.4%); 2(4.5%) from Agit'1' and '2' both situated at off-campus hostel respectively. Of the twenty-eight cases (63.7%) reported in October, six (13.6%) were from on- campus while six-teen (36.4%) from off-campus and six (13.6%) from other hostels (Table 3).

Table 3: Number of reported cases of BBD per months during the outbreak

Months/Collection	On-campus hostels		Off-campus hostels		Others	Total	%
	General hostel(GH,	PPP/Bay star hostel	Lambo A & B hostels	Agit 1 & 2 hostels			
July	0	0	0	0	0	**0**	**0**
August	0	0	1	0	1	**2**	**4.5**
September	1	1	4	2	3	**11**	**25**
October	3	3	9	7	6	**28**	**63.7**
November	0	1	2	0	0	**3**	**6.8**
December	0	0	0	0	0	**0**	**0**
Total	4	5	16	9	10	**44**	**100.0**

Source: Field survey, 2015

The result of the expression of feelings of the respondents based on clinical diagnosis is presented by Fig. 1. BBD disease condition manifested included blistering condition (39%), painless lesion (16%), swelling and itching and painless lesion (18%) each and dark mark at site (9%) (Figs.1, 3, 5).

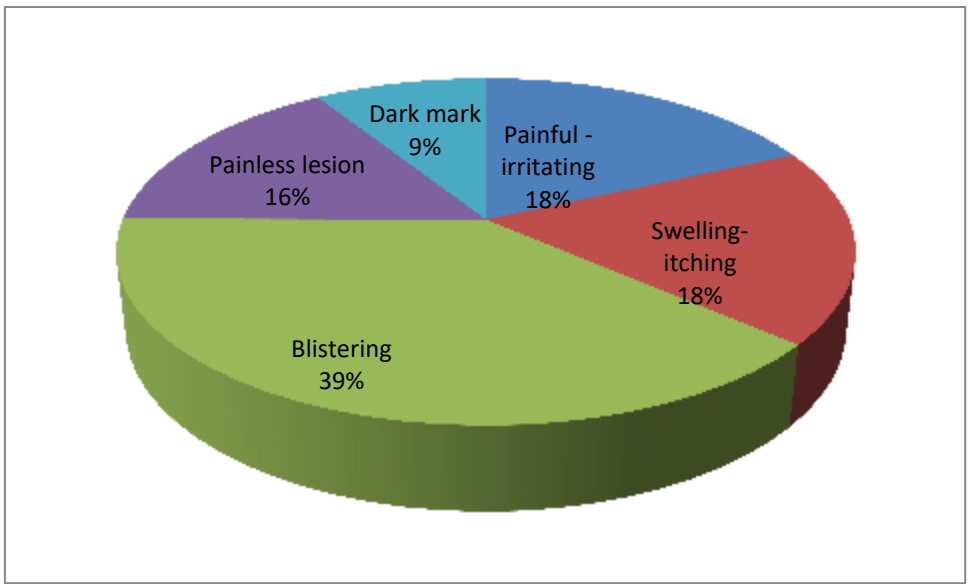

Fig-1: Nature and clinical symptoms expressed by patients with BBD

The result of the environmental and other factors predisposing the high incidence and outbreak of blister beetle dermatitis at the study area included crushing the beetle on contact with body parts (31.8%) proximity of hostels to vegetation and sleeping in room and corridors with light on both (22.7%) and closeness of hostels to agricultural farms (13.6%), (Fig. 2).

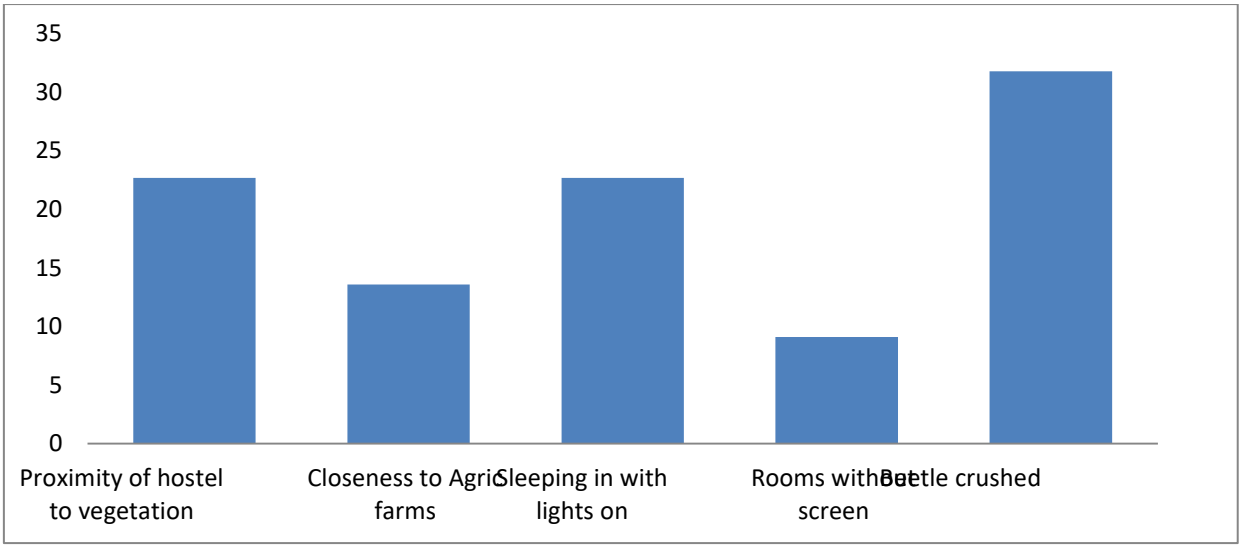

Fig: 2 Factors influencing the occurrence of the disease at the study area

The entomological data on monthly collection of the blister beetle at the study sites during the outbreak period is presented in Table 4. Of the 13,079 blister beetles collected from the study sites, the highest collection was made in October, 10853(83%), followed by September, 1018(7.8%); August (2.4%) and the least in July (0.7%).

Table 6: Blister beetle monthly average collection per site

Months/Collection	On-campus hostels		Off-campus hostels		Others	Total	%
	General hostel(GH,	PPP/Bay star hostel	Lambo A & B hostels	Agit 1 & 2 hostels			
July	15	11	22	36	06	**90**	**0.7**
August	18	25	102	42	129	**316**	**2.4**
September	258	120	322	188	130	**1018**	**7.8**
October	2954	2304	3842	1233	520	**10853**	**83.0**
November	241	112	276	125	45	**799**	**6.1**
December	1	2	0	0	0	**3**	**0.20**
Total	3487	2574	4564	1624	830	**13079**	**100.0**

Source: Field survey, 2015

Fig-3: A student with blister beetle dermatitis head

Fig-4: Blister beetle skin lesion on infection on the upper chest region

Fig.5: Blister beetle dermatitis on two Spots on the thigh of a female student

Fig-6: Sample of blister beetle Lytta vasecatoria collected during the study

Fig. 7: Skin lesion and blisters sustained as a result of crushing Blister Beetle on contact with skin

DISCUSSION

The result of the study of the entomological and environmental data collected and beetle identification implicated soft-bodied, long-legged army green coloured beetle Lytta sevicatoria (true blister beetle) as the agent responsible for the current outbreak of blister beetle dermatitis on students from the University hostels, staff and some other members of the Kwara State University community Malete. This observation is in contrast with the findings of other studies on blister beetle belonging to genus Paederus as the main causative agents of human blister dermatitis [26].

Lytta sevicatoria in the current outbreak affected people of varied age groups, mostly students and young adults of both sexes with high male prevalence in the university community. This finding could be as a result of occupational exposure as most affected is education seeking youths. Majority of students and staff affected were resident in the various hostels and residential quarters of the University, close to farm lands and vegetation. Other studies had similarly reported closeness of hostels and residential quarters to agricultural farms and other vegetation as natural habitat for beetles and probable source of BBD infection as the blister beetles are attracted by the lights in the hostel rooms and corridors. For instance, Gary *et al.;* [27]; Heo, *et al.;* [28] and Singh *et al.;*) [29] similarly observed an outbreak of dermatitis caused by Paederus fuscipes in student hostels in Selangor, Malaysia.

The parts of the body of the individuals affected by blister beetle skin lesion were the face and neck, trunk, upper and lower limbs. The disease condition manifests clinical signs and symptoms such as redness, blistering, painful and irritating swelling and itching of the affected areas after contact with the blister beetle body fluid. The blister were observed mostly after wake up in the early morning hours as some infected individuals often remembered coming in contact with and crushing of soft bodied greenish beetle [28,30].

Most cases of the current episode were reported in September and October 2015 which coincides with rainy season at the study area. This finding is in consonant with the peak time for the occurrence of beetle dermatitis widely reported in literature as most occurrence were recorded in the months of September, October and November. Habitat specificity and rainfall pattern have been profoundly responsible for such outbreaks [31-33]. This study also revealed that many of the University community members affected by BBD has their first contact with the Lytta sevicatoria during the current episode and are quite unaware of the effect of crushing beetles and exposure of its body fluid to human body.

CONCLUSION

Previous history and experience with the blister beetle seemed paramount in the recognition, identification of the beetle, its human skin blister problem diagnosis, management, control and possible prevention. Lack of previous exposure may lead to further complications on management procedures and secondary health problems that may arise from wrong diagnosis and treatment by public, entomologists and other health management experts.

Recommendations

To prevent future incidence of the blister beetle skin lesion outbreak the following recommendations are proffered:

- Creating awareness of the Blister beetle, its management and control tactics through enlightment program among the students, staff and other members within and outside the Kwara State University community.

- Avoid citing agriculture crop farms close to and clear dense vegetations near dwelling places.
- Avoid contact with and crushing blister beetles on parts of the body and if crushed, immediately wash the area with soap and water and report for adequate medical care at the nearest hospital.
- The windows and doors must be fitted with insect screen and light -proof curtains to prevent light attracting the beetle at night.

Abbreviations:

BBD, Blister Beetle Dermatitis, KWASU, Kwara State University, BCA, Blister Causative Agent**,** BSH, Bay Star Hostel, FGH, Female General Hostel

Ethical considerations:

All aspects of the study were approved by the Kwara State University Ethical Review Board.

Conflict of Interest:

We declare no conflict of interest

Responsibilities of authors:

AMA conceived the idea and develops the manuscript, IAA and OAO restructure the concept and assist in the development of the manuscript, SKB, NBI collate and develop relevant literatures, AAA collect and analyze data while EBA supervise the study.

REFERENCES

1. Padhi T, Mohanty P, Jena S, Sirka CS, Mishra S; Clinicoepidemiological profile of 590 cases of beetle dermatitis in western Orissa. Indian J. Dermatol. Venereol. Leprol, 2007; 73: 333-335.
2. Russo D; Zoogeography: an ecological perspective. Chapter of the Encyclopedia of Life Support Systems (commissioned paper), EOLSS-Unesco, 2011.
3. Singh A, Singh AK, Singh D, Varghese A; Blister beetle dermatitis: few observations helping in diagnosis. Int. J. Prev. Med. 2013; 4(2): 241.
4. Nasir S, Akram W; Study of bionomics of skirt and blouse beetle (Paederus fuscıpes Curtis), 1826 (Coleoptera: Staphylinidae, Paederinae). Pakistan J. Agri. Sci., 2012; 49(4): 447-450.
5. Bologna MA, Pinto JD; Phylogentic studies of Meloidae (Coleoptera), with emphasis on the evolution of phorsey. Systematic Entomology 2001; 26: 33-72.
6. Arnett RH, Thomas MC, Skelly PE, Frank JH; American Beetles, Volume 2. Polyphaga: Scarabaeoidea through Curculionidaea. CRC Press, Boca Raton, Florida, 2002; 861.
7. Oyedeji OA, Adebami OJ, Oyedeji GA; Linear Dermatitis following contact with the rove beetle in Nigerians: a report of 2 cases. Int. J. Trop. Med., 2006; 3(1): 6.
8. Arnett JR RH; False blister beetles, Coleoptera: Oedemeridae. Featured Creatures. EENY-154, 2008.
9. Ahmed AR, Moy R, Barr AR, Price Z; Carpet beetle dermatitis. J. Am. Acad. Dermatol., 1981; 5: 428-432.
10. Diogenes MJ; Contact dermatitis by pederin: clinical and epidemiological study in Ceara State, Brazil. Rev. Inst. Med. Trop., Sao Paulo, 1994; 36(1): 59-65.
11. Kartal DSP, Atacan D, Eskioglu F; Cantharidin treatment for recalcitrant facial flat warts: a preliminary study. J.Dermatol. Treat., 2009; 20(2): 114-119.
12. Ali M.A, Abdel-Rhaman G.A, lbrahim l.L, El-sheikh W.E.A; The blister beetle Meloe proscarabaeus L., a new insect pest threatens legume crops in El-Farafra oasis-Egypt. J.Agric. Res., 2005; 83(3): 1187-1200.
13. Powell JA; Coleoptera. In: Resh VH, Cardé RT (eds.). Encyclopedia of Insects, 2nd ed. Academic Press 2009; 1132.
14. Selander RB, Fasulo T.R; Blister Beetles (Insecta: Coleoptera: Meloidae). Originally published as DPI Entomology Circular 268), Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, USA. 2000; EENY-166: 7.
15. Townsend LH; Blister beetles in alfalfa. University of Kentucky Entomology, 2002.
16. Tirgari S, Nikbakhtzadeh MR; Paederus beetles (Coleoptera: Staphylinidae): an urban problem in Iran. In: International conference on urban pests, 4, Charleston, South Carolina. 2002; 401-7.
17. Mizota K; Additional records on dermatitis caused by three oedemerid species (Coleoptera: Oedemeridae). Med. Entomol. Zool. 2001; 52(1): 63-66.
18. Eisner T, Eisner M, Siegler M; Secret weapons. Defenses of insects, spiders, scorpions, and other many-legged creatures. The Belknap press of Harvard university press, Cambridge USA, 2005.
19. Ashton R, Leppard B; Differential Diagnosis in Dermatology 3rd Edition. Radcliff Publishing Limited: Oxford, 2005.
20. Murray, S. Blum; Chemical defense. Dan's encyclopedia on insects, second edition 2009. Ed. Vincent h.Resh and Ring T. Cardé. Academic press, Elsevier, Inc.
21. Dinev I; The darkling beetle (Alphtobius diaperinus)-a health hazard for broiler chicken production. Trakia J. Sci., 2013; 1.
22. Keay RW.J; An outline of Nigerian vegetation. Federal department of forest research. Federal government Printer, 1953.

23. Ogunwale JA, Olaniyan J.O, Aduloju M.O; Detailed Survey of the University of Ilorin farm Site. University of Ilorin –Technical Report. Entomology/entfacts/fldcrops/ef102.hm, 1999.
24. Adegbola A.A, Onayinka E. A.O; A review of range management problems in the southern guinea and derived savanna zones of Nigeria. Tropical grasslands, 1976; 10 (1).
25. Kwara Agricultural Development Project (KWADP); House Journal and Bulletin, 2008.
26. Zargari O, Kimyai-Asadi A, Fathalikhani F, Panahi M; Paederus dermatitis in northern Iran: A report of 156 cases. Int J Dermatol 2003; 42:608-12.
27. Gary M, Mullen GR, Durden L; In Medical and Veterinary Entomology. Pederin contacts human skin only when a beetle is brushed vigorously over the skin or crushed. Academic Press, 2009; 102.
28. Heo CC, Latif B, Hafiz WM, Zhou HZ; Dermatitis caused by Paederus fuscipes Curtis, 1840 (Coleoptera: Staphilinidae) in student hostels in Selangor, Malaysia. Southeast Asian J Trop Med Public Health 2013; 44:197-205.
29. Singh G, Yusuf Ali S; Paedrus Dermatitis. Indian J Dermatol Venereol Leprol 2007; 73:13-5.
30. Davidson SA, Norton SA, Carder MC, Debboun M; Outbreak of dermatitis linearis caused by Paederus ilsae and Paederus iliensis (Coleoptera: Staphylinidae) at a military base in Iraq. U.S. Army Med. Depart. J., 2009; 6-15.
31. Handa F, Sharma P, Gupta S; Beetle Dermatitis in Punjab (a study of 77 cases). Indian J Dermatol Venereol Leprol 1985; 51:208-12.
32. Alva-Davalos V, Laguna-Torres VA, Huaman A, Olivos R, Chavez M, Garcia C; Epidemic dermatitis by Paederus irritans in Piura, Peru at 1999, related to El Nino phenomenon. Rev Soc Bras Med Trop. 2002; 35: 23-8.
33. Uslular C, Kavukcu H, Alptekin D, Acar MA, Denli YG, Memisioglu HR, *et al.;* An epidemicity of Paederus species in Cukurova region. Cutis 2002; 69:277-9.