

High prevalence of bedbugs *Cimex hemipterus* and *Cimex lectularis* in camps for internally displaced persons in Freetown, Sierra Leone: A pilot humanitarian investigation.

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Summary

The prevalence of bedbugs *Cimex hemiptera* and *C. lectularis* was investigated in camps for the internally displaced persons (IDPs) in Freetown, Sierra Leone. Two hundred and thirty eight rooms were searched during the day and at night, and 233 (98%) of those rooms in 30 booths were infested with different life cycle stages of bedbugs. There hundred and ninety-eight (68%) of the bedbugs were adults, 145 (24.8%) were nymphs of various instars, and 41 (7%) were clusters of eggs. Significantly ($P > 0.05$) more bedbugs were recovered during the night inspections 64.6% as compared to 35.4% during the day inspections. In addition, more adult bedbugs were recovered at night than during the day, a manifestation of their peak feeding period. Of the total of 570 adults and nymphs collected and identified, 320 (56.1%) and 250 (43.9%) were *Cimex lectularis* and *Cimex hemipterus* respectively. Clinical examination of 221 individuals living in the booths during 3 consecutive weeks of examinations and treatment for conditions suggestive of bedbug infestation (bites and skin reactions as well as treatments for other health and medical conditions) showed that 196 (86%) had wheals as a direct result of bedbug bites. The data of this pilot humanitarian investigation shows a high prevalence of bedbug infestation in these displacement camps. It is recommended that some control measures be instituted, like residual insecticide application along with integrating control methods within the primary health care system, because bedbugs are a source of great irritation and sleepless nights that could lead to stress.

Keywords: Bedbugs, *Cimex hemiptera*, *Cimex lectularis*, Internally displaced persons, Camps, Sierra Leone.

Résumé

La prevalence de punaises «*Cimex hemiptera*» et «*C. lectularis*» a été étudiée dans des camps de personnes déplacées à l'intérieur de Freetown en Sierra Leone. Deux cent trente huit salles ont été examinées de jour et de nuit et 233 (98%) de ces salles dans 30 baraques étaient infestées de punaises avec différents niveaux de cycle de vie. Trois cent quatre vingt dix huit (68%) des punaises étaient adultes, cent quarante cinq (24.80%) étaient des nymphes de divers niveaux de développement et 41 (7%) étaient des groupes d'œufs. On a découvert de manière significative plus de punaises pendant les infections nocturnes soit 64.6% que dans la journée soit 35.4%. En outre, davantage d'adultes ont été trouvés de nuit que de jour, une manifestation de leur période de pointe. Sur un total de 570 adultes collectés et identifiés, 320 (56.1%) et 250 (43.9%) étaient respectivement des «*Cimex lectularis*» et «*Cimex hemipterus*». L'examen clinique de 221 individus vivant dans les camps pendant les 3 semaines consécutives d'examen et de traitement pour conditions faisant suite à une infestation de punaises (piqûres et réactions cutanées aussi bien que traitements pour autres problèmes médicaux et de santé) a montré que 196 (89%) avaient des frémissements comme résultat direct de piqûres de parasites. Les

données de cette investigation humanitaire pilote montrent une haute prevalence d'infestation de punaises dans ces camps. On recommande d'instituer certaines mesures de contrôle, telles que l'application résiduelle d'insecticide en même temps que l'intégration de méthodes de contrôle dans le système de soins de santé primaire, car les punaises sont une source de grande irritation et de nuits sans sommeil qui pourraient conduire au stress.

Introduction

Poor living conditions and over crowding in refugee camps in Africa makes them breeding grounds for ectoparasites like scabies and bedbugs. While much has been written about the public health importance of scabies in crowded, unhygienic settlements, little is known about bedbugs in refugee camps. Bedbugs (*Cimicidae*) are voracious blood feeders and can cause intense skin reaction¹. Bedbugs live and reproduce in cracks and crevices in walls, furniture, and in beds and bedding. They feed usually at night and they are distributed worldwide, with the tropical bedbug, *Cimex hemipterus*, parasitizing humans in hot climates and the common bedbug, *C. lectularis* in temperate areas¹. Bedbugs constitute a public health problem because of their persistence and disturbing bite, especially at night, leading to loss of sleep and even iron deficiency in children^{2,3}. Bedbugs have been implicated in the transmission of hepatitis B^{4,5,6}. However, despite careful observations, bedbugs have not been shown to be involved in the transmission of any communicable diseases.^{7,8}

The civil war in Sierra Leone has generated over 200,000 internally displaced persons (IDPs). Majority of these displaced live in overcrowded camps with gross unhygienic conditions and suffering. In addition, this civil war which began in 1991 has claimed the lives of over 100,000 people and displaced roughly 2.5 millions other Sierra Leoneans. Most of the refugees are in Guinea, Liberia, and Ghana, in addition to the IDPs in the country, temporarily resident in the IDP camps. In addition, the physical and psychological stress caused by the trauma has left majority depressed and too fatigued to worry about bedbugs. This paper describes the prevalence of bedbugs in the seven IDP camps in Freetown, Sierra Leone. The humanitarian investigation was part of a large humanitarian health assistance project carried out in seven camps in and around Freetown in the summer of 1999. The objectives of this specific aspect of the humanitarian investigation were (i) to determine the prevalence of bedbug infestation among a randomly selected population in IDP camps in Freetown, Sierra Leone; (ii) provide short-term treatment and education to the residents of the IDP camps; and (iii) make recommendations to the Ministry of Health and Sanitation to reduce the burden from the biting bedbugs through the use of residual.

The tents/booths that housed the displaced people who came from different parts of the country were divided into rooms, with an average size of 4 square meters. Each room accommodated about six family members however, some rooms had more than one household per room. The rooms in each booth are located next to each other, built with sticks and partitioned with tarpaulin

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materials. Two hundred and thirty eight rooms from thirty booths, housing over 1,500 inhabitants, were investigated.

Materials and methods

Study area

The study was carried out in six of the nine internally displaced persons' camps (IDP), all located in Freetown, the capital of Sierra Leone. The list of camps located in the Western area of the country is shown in table 1. The populations in the camps were estimates because potential new residents arrived almost daily as the fighting intensified. They are usually screened and registered by the non-governmental organisation responsible for particular camps. The residents of the camps displaced by the war came from almost all the districts in the country that has been affected by this 10-year rebel war.

Collection and identification of bedbugs.

Two methods were used to collect and classify bedbugs from the rooms and booths. The first was the examination of mattresses, bedding, clothes etc. during the day. Because there were no beds, all mattresses, bedding, pillows, and all sleeping materials were taken outside during the day and carefully searched for all life cycle stages of bedbugs (i.e. eggs, nymphs, adults). All eggs, nymphs and adults of bedbugs were collected, counted, and recorded. There were four collectors for each mattress and all adult bedbugs were collected and immediately placed into containers with 0.2 ml of residual insecticide in it to kill the bedbugs and prevent them from escaping. The second method was done at night with the help of a flashlight. The cracks and crevices in the sticks used as support pillars in building the booths were searched for the hiding places of bedbugs. The characteristics of infestation that were searched for were spots of excreta, eggs, and cast off skins. To facilitate the emergency of the bedbugs, an aerosol (Sheltox) was sprayed into the cracks, penetrating the cracks, and forcing the bedbugs to come out. All life cycle stages of bedbugs (nymphs and adults) that came

of Ghaun⁹ and Furman and Catts¹⁰. In addition, all egg clusters were also collected, counted, and recorded as egg clusters.

Clinical examination for bedbug bite related wheals

Each resident in a booth was informed about the need and advantage of undergoing physical examination. Experienced volunteer physicians clinically examined 220 people during weeks 1, 2 & 3 for wheals and for other conditions suggestive of bedbug infestation and bites. This was done to detect any bedbug bite related wheals and to provide treatment if necessary for other health and medical conditions that could be managed immediately. In addition, they were taught how to look for *Cimex* bitemarks on their skin. Furthermore, they were also taught how to detect the presence of wheals resulting from bedbug bites. Each resident was questioned on any evidence of bedbug infestations and bites in the past few years while displaced that may have healed and disappeared. This information was important because it provided a proof of continuous bedbug infestation due to the overcrowding and unhygienic living conditions in the various IDP camps in the country and in other countries as well.

Furthermore and in order to understand how much the people knew bedbugs as pets, a knowledge, attitude, and practice (KAP) survey was conducted among the residents of the IDP camps. The objective was to determine their knowledge about bedbugs. They were asked to state when bedbugs preferred to feed and to explain if they knew of any reactions due to bedbug bites.

Results

The population in the various camps in and around Freetown is how in Table 1. Over crowded camps like Approved School, Waterloo, and National Workshop provided ideal conditions for the breeding and proliferation of bedbugs.

The prevalence of bedbug infestation in the IDP camps was high. Of the 238 rooms searched, 233 (98%) of those rooms in 30 booths were infested with bedbugs (Table 2). Overall, the difference in the prevalence of bedbug infestation in the IDP camps was

Table 1 Internally Displaced Persons (IDPs) camps in Western area, Sierra Leone

Name of Camp	Location	Managing Agency/NGO	Camp Population
Amputee Camp 946 people + 264 amputees	Aberdeen Road	MSF/F	(1210)
Approved School	Wellington	IIRO	15,089
Bailor Barrie Garage	Bai Bureh Road	SLRCS	1,350
Gafton	Grafton	GOSL	5,000
Mandella Camp	Ross Road	ARD	412
National Workshop	Cline Town	ARD	10,000
Parade Ground	Circular Road	CORD-SL	1,000
Trade Center Camp	Ferry Road, Kissy	EF-SL	1,365
Waterloo	New Site	ADRA	15,000
Total population in all camps			50,426

Table 2 Bedbug infestation in displacement camps in Freetown, Sierra Leone

	Examination of tents for all stages of bedbugs		
	Day inspection No (%) recovered	Night inspection No (%) recovered	Total No (%) recovered
No of rooms examined	-	-	238
No. of all stages of bedbugs found	282	302	584
Adult bedbugs recovered	123 (31.0)	275 (69.0)	398 (68.2)
Nymphs (I-V) instars	69 (48.6)	76 (52.4)	145 (24.8)
Clusters of eggs	26 (63.4)	15 (36.6)	41 (7.0)
Total	207 (35.4)	377 (64.6)	584 (100)

out were collected, counted, recorded, and identified as *Cimex sp.* from the shape of the pronotum, abdomen, and body size according to the methods of Ghauri⁹. Further differentiation between *C. hemiptera* and *C. lectularius* was done using the modified methods

comparatively high. Table 2 also shows that a total of 584 specimens of bedbugs were found and identified in the 30 booths in the displacement camps. Three hundred and ninety-eight (68%) were adult bedbugs, 145 (24.8%) were nymphs of various instars, and 41 (7%) were clusters of eggs (Table 2).

Table 3 Collection of bedbugs (*C. hemipterus* and *C. lectularis*) in internally displaced camps in Freetown in Sierra Leone

	<i>Cimex hemipterus</i> *	<i>Cimex lectularis</i> *	Total
Day recovery of adult bedbugs	99	24	123
Night recovery of adults	100	202	302
Day recovery of nymphs	20	49	69
Night recovery of nymphs	31	45	76
Total	250	320	570

*They were differentiated according to the methods of Ghauri⁹ and Furman et al¹⁰

The difference in recovery of all life cycle stages was significantly higher by the t-test during the night examination 64.6% compared to 35.4% during the day inspection ($P < 0.05$). The same patterns are seen when the data is categorized into adults and nymphs (Table 2). Twice as many adult bedbugs were recovered during the night (69.0%) compared to only 31% of the adults recovered during the day inspections ($P < 0.05$). However, the night recovery of the nymph stages was not significantly different from the day recovery (Table 2). In contrast, the difference in the egg cluster recovery during the day was significantly higher (63.4%) ($P < 0.01$) than the night recovery rate (36.6%). Similarly, when the total 570 nymphs and adults bedbugs were identified and differentiated, *C. lectularis* constituted 320 (56.1%) while *C. hemipterus* accounted for 250 (43.9%) (Table 3). The night time collection of both nymphs and adults were again higher than the daytime collections (Table 3). Furthermore, more *C. lectularis* were collected at night (202) as compared to the day collection of 100 *C. hemipterus* adults. During the day however, more *C. hemipterus* adults (99) than *C. lectularis* adults (24) were collected. Of the 221 people examined from infested booths, 196 (89%) had wheals as a direct result of bedbug bites.

Discussion

The data presented in this paper indicate that the high bedbug infestation in these IDP camps in Freetown, and is indeed a public health problem among these displaced with a possibility of spreading to the inner city of Freetown. This high prevalence of bedbugs in these camps is directly related to the social stigma and may be an index of the unhygienic conditions and overcrowding in these IDP camps. These bedbugs are a source of great irritation and sleepless nights and could lead to stress. Because of the social stigma attached to bedbugs, interactions between refugees could be limited but the transmission of the bedbugs would increase because of the nature of overcrowding in these IDP camps. All these observations are in agreement with the pestive active nocturnal feeding activities of the bedbugs, but do not corroborate a number of recent studies indicating that the *Cimex* can act as a vector in the transmission of diseases^{6, 7, 11}. Bedbugs have also been shown to possess vector attributes suitable for the transmission of *Coxiella burnettii*, the cause of Q fever¹². In addition, the skin reactions detected among the people were due to bedbug bites and the severity depended on the immunologic status of the host¹². Nevertheless, despite all these observations, bedbugs have not been shown to be involved in the transmission of any communicable diseases.

The bedbug infestation rates are known to vary widely, even under normal conditions. In two different studies, Newberry and Mchunu^{13, 14} reported a lower prevalence rate of 22% in the same huts as compared to a 44% prevalence rate four years earlier⁷. It is however, not clear whether the same persons were living in the same huts during the initial study and the second study four years later. This study shows that bedbug infestation is a significant public health problem among the displaced people resident in camps in Sierra Leone. Though the prevalence rates are high, it is difficult to make sweeping policy changes based on this pilot report. Nevertheless, the Ministry of Health and Sanitation should be aware of this result, and use it as an entry point. Since no other data exist

on bedbug infestation in Sierra Leone, there is a need for a more comprehensive study into this problem.

There has been mixed results when insecticides are applied to infested areas on a small scale, since re-infestation occurs rapidly¹³. The spraying killed the natural predators of bedbugs, leading to the increase in the bedbug population. On the contrary, pyrethroid-impregnated bed nets have shown good promise against bedbugs. In the Gambia, bedbugs and chicken ticks disappeared after 4 months in homes with insecticide treated bednets¹⁵. Bedbugs can be controlled by the use of treated bednets, which also helps in the control of malaria. For example, in Tanzania, bedbug infestations were eliminated from all houses where permethrin-impregnated bednets were used⁸. The people knew all about bedbugs, indicating their painful bites, mostly at night. They also knew where to find the bedbugs both during the day and at night. These bugs are vividly described with local names like *the Chinch* in the pigeon English, *Gbangbatar* in Kono, *Gbengbeyawie* in Mende etc. The people thought that in addition to mosquitoes causing fever, bedbugs were also responsible for fever, especially in children. However, even though they knew the problems caused by these bedbugs, they were too busy running away from the rebels to practice prevention. Based on these findings, we gave them information on the life cycle of the bedbugs and on how to practice preventive and control methods, i.e. searching for and killing all stages of the bugs, use of insecticide treated bednets, where affordable, use of residual insecticides like Sheltox in individual tents etc. It is recommended that some control measures be instituted and integrated within the primary health care system, including health education about the live cycle of *C. hemipterus* and *C. lectularis* and other insects of medical importance in all IDP and refugee camps and in the entire community.

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