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Brief Report

Mortality in neonate bats infested by ectoparasite bugs in India; humans are at risk too

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Abstract: Human bed-bugs are well known and are found almost all over the world. Many types of bugs that infest various species of bats (Chiroptera: Mammalia) are found in different geographical areas or ecosystems, feeding on their blood. These small bugs, which are external parasitic insects, belong to the family Cimicidae of the order Hemiptera of the class Insecta of the phylum Arthropoda of the animal kingdom. Their bites can cause negative health effects in humans such as skin reactions, anemia, insomnia, anxiety, and panic attacks. Although their bites and bloodsucking do not kill any host. In general, bat-bugs infest adult and old bats. But, recently in Udaipur, Rajasthan, India, six neonates or neonate bats of small Asiatic yellow bats (*Scotophilus kuhlii*) were also found infested with bat-bugs ectoparasites belonging to the genus *Cimex* Linnaeus, 1758 (*Cimex pattoni*). Such a rare and unique instance has never been observed and reported earlier from any geographical area in the world. Interestingly, out of these, three were also found dead (66.6%), two were in a dying state, and one was in a critical condition or struggling for survival. Due to our limitation, the exact cause of death in these infested bat neonates with bug parasites has not been investigated. In the present communication, details of this case have been focused on and also focus on how much people are at risk of infestation from these external parasitic bat-bugs.

Keywords: Asian yellow bats (*Scotophilus kuhlii*); neonate bats; bat-bugs; ectoparasite; health; humans; infestation; insects; India

1. Introduction

There are many species of tiny bugs found all over the world that are external parasitic insects of the family Cimicidae, belonging to the order Hemiptera of the class Insecta of the phylum Arthropoda of the animal kingdom [1]. In India, these insects are commonly known as “Khatmal” (in Hindi). However, maximum study and information about them is limited to human bed-bugs (*Cimex lectularius, C. lectularius, C. hemipterus, C. rotundatus, C. piloselus, C. pipistrale*, etc.). Generally, these ectoparasite bugs prefer to live in cracks and crevices, and they can survive in an unfavorable environment without food (blood) for many months or even years [2]. These nocturnal insects are also well adapted anatomically, morphologically, and physiologically, due to which they can survive for a long time even in adverse environments and have evolved excellent organs to suck the blood of not only human beings but also of various species of bats (Chiroptera: Mammalia) living in deserted ruins, abandoned buildings, caves, houses, and cracks and hollows of trees

around human settlements. Interestingly, they do not spare even the small cliff swallow (*Petrochelidon pyrrhonota*) which lives in mud nests under houses, buildings, and bridges [3,4]. These insects also infest birds and have been reported in birds like chickens, owls, and woodpeckers. These insects are also called bed-bugs, bat-bugs, swallow-bugs, and poultry-bugs depending on their host species. But all insects of different host species, be it human beings, bats, or birds, look almost similar in morphology or structure, and their behavior is also almost similar. Bat-bugs are very similar to bed-bugs and are so similar in appearance that they are often mistaken for bed-bugs. Therefore, a microscopic examination is required to correctly identify them. Interestingly, these bat-bugs can also bite humans and cause negative health effects such as skin reactions, anemia, insomnia, anxiety, and panic attacks in people [5–7]. In general, bat-bugs infest adult and old bats but not neonate bats. But, recently in Udaipur, Rajasthan, India, neonate bats of small Asiatic yellow bats (*Scotophilus kuhlii*) (**Figure 1a–d**) were also found infested with bat-bugs ectoparasites belonging to the genus *Cimex* Linnaeus, 1758 (*Cimex pattoni*) (**Figure 1d–f**). Such a rare and unique instance has never been observed and reported before from any geographical area in the world. Among these infested neonate bats, 66.66% are also found dead. In the present communication, details of this case have been discussed, and there is also a focus on how much people are at risk of infestation from these external parasitic bat-bugs.

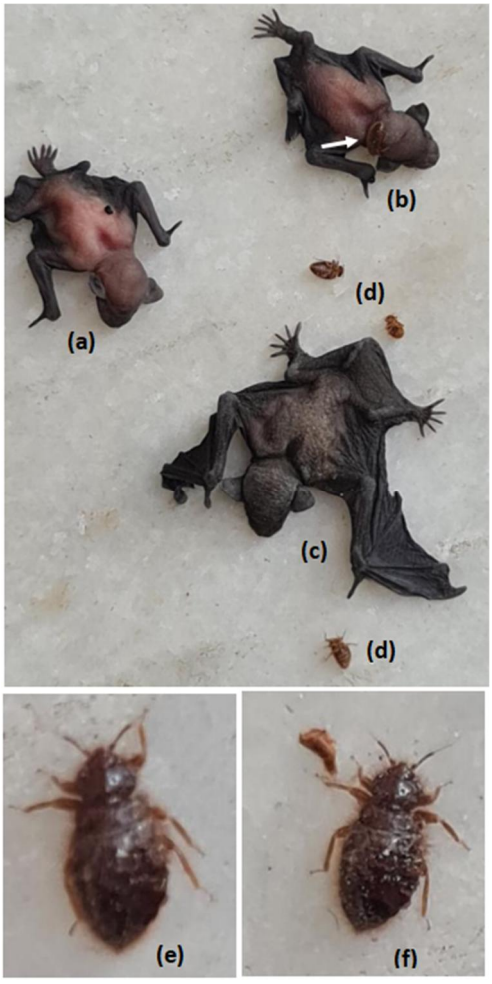

Figure 1. Baby or neonate bats infested with ectoparasite bugs.

One of these neonate bats has died **(a)**, while others infested with bugs are struggling to survive **(b,c)**. Some bugs **(d)** have been isolated from the baby bats **(c)**. Mature **(e)** and immature bugs **(f)** were recovered from the neonate bats **(b,c)**. Arrow indicates bug parasite sucking blood at dorsal side of neck region.

2. Mortality in infested neonate bats with ectoparasite bugs

Recently, during the rainy season (July, 2024), six small babies of small Asian yellow bats (*S. kuhlii*) were found lying under a cement pipe protruding from the roof of a house in Udaipur city of Rajasthan (India). Of these, three were found dead, two were in a dying state, and one was in a critical condition or struggling for survival. On closer inspection, 3-4 small bugs were found stuck on the dorsal surface of all these neonates or babies. When these bat-bugs were pressed lightly, blood oozed out of them. In fact, all these bat-bugs were full of blood. Surprisingly, when they were separated from the neonate bats with the help of a thin wooden stick, some of them quickly ran back towards these babies and stuck to their bodies again. There were some who fell upside down during separation. But in a short while, they immediately got back upright and ran towards these babies and stuck to them again. Such aggressive behavior of theirs was never seen and reported before. How do these insects or bat-bugs recognize their host, and how are they attracted towards them? But in the absence of research, it is not right to say so.

In the present study we found 66.66% mortality in baby bats infested with bugs. It is well known that blood sucking by bugs can cause mild to severe anemia depending on the parasitism or parasitaemia [8–11]. Parasitic bugs also suck the blood of neonate bats and develop anemia, which can cause mortality in them. However, we have not investigated the hemoglobin (Hb) level in any infested neonate bats to confirm the evidence of anemia in them. On the other hand, it is also possible that they die due to starvation. However, without any concrete evidence, it is difficult to say what was the exact cause of death in these newborns, and it is not clear yet. The truth is that we have suddenly come across this case, or this case has come to us by chance. In fact, due to our limitations, we have not investigated to find out the cause of postnatal death, so this can be a subject of further research.

In the world, various species of bat-bug ectoparasites derived from different bat host species have been well studied and reported from different geographical provinces [12,13]. In India, the first report on bat-bugs was reported in 1912 [14]. Subsequently, more than 15 more species of bat-bugs belonging to the family Cimicidae have been reported in different species of bats surviving in or around human habitations, which have been well reviewed [15–23]. From the states of Rajasthan and Gujarat of the country, five species of bat-bugs (*Cimex ueshimai, C. pattoni, Cacodmus bhati, Leptocimex hiregaudari, and Stricticimex namru*) from six species of bats (*Pipislrellus dormeri dormeri, Tophozous longimanus, Scotophilus heathi heathi, Taphozous kachhensis kachhensis, Rhinopoma microphylum microphyllum, and Tadarida aegyptiaca thomasi*) belonging to the Pteropidae family have also been reported [14,15]. Based on the literature, the current species of the ectoparasitic bug is *C. pattoni*, recovered from the pups of either *S. kuhlii* or *S. heathi heathi*. Though both species are small and have little difference in their

morphology, the habitats are quite different. However, the first species is more accurate and possible, as these small creatures also roost in hidden places (cracks, crevices, cemented pipes coming out of the roofs of houses, abandoned buildings, hollows of nearby trees, etc.) found in the vicinity of human habitation. The present neonate bats were also found in similar habitat or lying under a cement pipe coming out of the roof of a house. This species enters people's homes at night whenever it gets a chance. Which can also be a danger to humans. Because when these bats hide in houses, their bug parasitic insects also go to the houses along with them, which hide in the nearby cracks and bite the people of that house and suck their blood as soon as they get a chance. It is, generally, believed that the bite of these insects does not spread any infectious disease in humans. But human bed-bugs have been reported to be carriers of many pathogens [23–30]. Bed-bugs have also been found to be infected in nature with *Wuchereria bancrofti* and *Brugia malayi* (causes of filariasis)*, Trypanosoma cruzi, Brucella melitensis, Coxiella burnetii,* and Rickettsia, which causes exanthematous typhus [13,23–30]. However, more authentic or scientific studies are still needed to confirm whether these bat parasites can cause and spread any infectious disease in humans.

3. Significance

The death of neonate bats suffering from bug parasites can affect their survival and population. The reduction in their population can harm the environment. Because bats are a natural source of controlling the population of various pests that harm economically important plants and agricultural crops [31,32]. Bats also disperse the seeds of fruit trees, thereby strengthening the existing ecosystem [33–35]. Due to the social behavior of bats and their proximity to human populations, bat-bug parasites can also be spread to humans. Much research is still needed in India to understand bat-bug parasitism and the behavior of different species of bats inhabiting human habitations. However, the significance of this report is that this is the first time that dead neonate or immature bats have been found infested with bug parasites, which is rare and unique. This important finding also adds to or expands the existing knowledge about parasitism in bats.

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