

Phlebotominae Sandflies Fauna (Diptera: Psychodidae) in Hamadan, Iran

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Article information	Abstract
<p>Article history: Received: 3 May 2011 Accepted: 1 July 2012 Available online: 21 Aug 2012</p> <p>Keywords: Fauna Sand fly Leishmaniasis Hamadan Iran</p> <p>*Corresponding author at: Department of Medical Entomology, School of Medicine, Hamadan University of Medical Sciences and Health Services, Hamadan, Iran. E-mail: ynazari@yahoo.com</p>	<p>Background: Cutaneous and visceral leishmaniasis is important endemic diseases in many parts of the world, including Iran, which are transmitted by bites of sandflies. This study is conducted to identify Phlebotomine sand flies fauna in Hamadan, Iran.</p> <p>Materials and Methods: This is a descriptive cross-sectional study which caught sand flies in the months of May, June, July, August, September and October. The catch was performed by sticky traps.</p> <p>Results: In this study, a total of 4871 sand flies were collected and identified. The number of sand flies caught from indoor and outdoor places was respectively 1302 (26.73%) and 3569 (73.27%). As a result of this study, nine species of sand flies were identified in the city of Hamadan, seven of which are of genre <i>Phlebotomus</i> (<i>P. papatasi</i>, <i>P. kandelakii</i>, <i>P. sergenti</i>, <i>P. major</i>, <i>P. caucasicus</i>, <i>P. ansarii</i>, <i>P. halpensis</i>) and two species are of the genre <i>Sergentomyia</i> (<i>S. sintoni</i>, <i>S. dentata</i>).</p> <p>Conclusion: In order to avoid the possible transmission of diseases and reduction of harassments of this insect during warm months of the year, personal protection such as use of mosquito nets, application of window and door mesh and use of repellents are recommended.</p> <p>Copyright © 2012 Zahedan University of Medical Sciences. All rights reserved.</p>

Introduction

Cutaneous and visceral leishmaniasis (with leishmania agent) is an endemic disease in many parts of the world, including Iran, which are transmitted by the bites of various species of Phlebotomine sand flies, from Diptera of the family of Psychodidae [1]. In Iran leishmaniasis is in two forms of cutaneous leishmaniasis (cause of disease in urban type of *leishmania tropica* and zoonotic type of *L. major*) and visceral or Kala-Azar (with agent of leishmania infantum) [2]. More than 70 out of 700 species of sandflies identified in the world are involved in transmitting different types of leishmaniasis. In the Old World vector species are in the genus *Phlebotomus* and in the New World, they are in genus *Lutzomyia* [3]. Habitats of this insect are diverse; however, they have activity mostly in tropical and subtropical areas and a limited number have also influenced the temperate regions [4]. Louri and Adler initiated the study on the sand fly fauna for the first time [5]. In 1961, Mesghali managed to identify 12 species of *Phlebotomus* and 11 species of *Sergentomyia* [5]. Through a research in 1975, Javadian and Mesghali reported the number of sandflies in Iran to be 42 cases [6]. Rassi et al. have currently reported 44 species of sandflies and 10 suspect species [7]. Azizi et al. have identified over 25 species (14 species of *Phlebotomus* and 11 species of *Sergentomyia*) as fauna of Mamasani county [8].

Mohammadi-Ezni et al. reported six species of the genus *Phlebotomus* and two species of the genus *Sergentomyia* in Damghan County [9]. The increase of temperature is directly related to the abundance of sandflies and

increases this insect in summer and consequently, leads to further bites and finally, will intensify the disease [7]. Hamadan city is among the areas where few cases of cutaneous leishmaniasis have been reported. Thus, considering the abundance of sand flies, especially in the warm months of the year (late spring and summer); this study has been conducted to identify sand fly fauna in the city and the central part of Hamadan.

Materials and Methods

This was a descriptive cross-sectional conducted in 1993 to determine fauna of sandflies in Hamadan and in warm months of the year and season of sand flies' activity, including late May, June, July, August, September and October. Hamadan province with 19445 square kilometers area is located in West of Iran between 33° 59' to 35° 48' north width and 47° 24' to 49° 36' east length of Greenwich meridian in at least 1555 meters above sea level. This city has a semi-cold weather (average temperature of 9.6°C and maximum 36.8°C and at least -29.6° C). July and August are the warmest and January and February are the coldest months of the year.

To study fauna and frequency of sand flies, three villages of the plain areas, three villages of mountainous areas and three locations inside Hamadan were selected and sandflies were caught once every 15 days from April to the end of October. The most appropriate method of sampling from sandflies was conducted from indoor (human and animal) and outdoor places using sticky traps.

At each sampling in each village, 60 sticky traps were installed (10 traps in the indoor and 10 traps in outdoor places and in three different locations and with distances from each other). Sticky traps were installed during the evening and one hour before the sunset and they were collected and transferred to the laboratory the next day in sunrise. In the laboratory, sticky traps related to a location are studied one by one and in case of presence of any sand flies, they will be gently transferred into acetone and then to the holder tube containing 70% ethanol via brush or entomologic needle for fat removal. Then, the pipe door will be closed to be assembled to determine their species. Pore solution was used for permanent assembling and lactophenol for temporary assembling. Samples collected were identified using reliable key of Iranian sandflies species identification [10].

Results

In this study, a total of 4871 sandflies were collected and identified to determine the fauna from predetermined locations. 3131 (64.3%) of all samples collected were male and 1740 samples (35.7%) were female. 1302 (26.73%) sandflies were collected from indoor and 3569 (73.27%) were collected from outdoor places (Table 1).

As a result of this study, nine species of sandflies were identified in the city of Hamadan, 7 of which were genre *Phlebotomus* and two of which are genre *Sergentomyia*, which respectively include (Table 1):

1-Phlebotomus papatasi which is the dominant species in the region and indoor places and was collected as much as 1585 numbers (32.54%) during the study. 581 (44.63%) out of this number were related to the indoor and 1004 numbers (28.13%) were related to the outdoor places. The sex ratio of this species is 193 males per 100 females.

2-Phlebotomus kandelakii, with 1415 numbers (29.05%) was at the second rank of all sandflies caught 278 (21.35%) of which were related to the indoor and 1137 (86.31%) of which were collected from outdoor places, which was the most abundant among the sandflies collected from outdoor places.

3-Phlebotomus sergenti, 318 numbers (24.43%) of this species was caught from indoor and 641 numbers (17.96%) from outdoor places and it generally includes 19.69% of the collected sand flies.

4-Phlebotomus major, the catch frequency of this species from indoor and outdoor places was 36 (2.76%) and 469 numbers (13.14%), respectively.

5-Phlebotomus caucasicus, 83 numbers (6.37%) of this species was caught from indoor and 243 (6.81%) from outdoor places.

6-Phlebotomus ansarii, 68 numbers (1.4%) of all caught sandflies was also related to this species.

P. halpensis, *S. sintoni* and *S. dentata* were only caught from outdoor places and, respectively, included 0.11, 0.14 and 0.11 which have included the lowest amount of catch.

Discussion

In the present study, a total of 4871 sandflies were caught, including nine different species which have high phonestic richness due to the climatic conditions of Hamadan. In their studies in Bam, Agassi and Sharifi identified two species of genus *Phlebotomus* and three species of genus *Sergentomyia* [11]. In the studies of Berenji et al. in the north area of Mashhad, the two species of both genus *Phlebotomus* and *Sergentomyia* were determined [12]. Doroudgar et al. identified a total of 17 species of sandflies belonging to the genus *Phlebotomus* (11 species) and *Sergentomyia* (6 species) from Kashan County [13]. In the study of Azizi and Fekri, eight species of sand flies, including three species of the genus *Phlebotomus* and five species of *Sergentomyia*, identified as fauna of sandflies of Jask in Hormozgan province [14]. The species of *Phlebotomus papatasi* among sandflies caught from indoor (44.63%) and outdoor places (28.13%) is considered the main vector of zoonotic cutaneous leishmaniasis and dominant regional species which is caught from all studied places in Hamadan with a relative abundance. In other centers of zoonotic cutaneous leishmaniasis, it is the decisive vector of this disease due to its dominance in indoor and outdoor places as well as rodent burrows [5, 7, 15].

According to the role of this species of sand fly in transmission of the three-day fever or Papatasi fever, which was a non-fatal viral feverish disease in the Mediterranean region and South Asia [13], it is suggested that studies should be conducted in this regard in Hamadan.

Table 1. Fauna and frequency of sandflies collected from indoor and outdoor places in Hamadan County

Species	Male N (%)	Female N (%)	Sex Ratio: Male/Females × 100	Indoor N (%)	Outdoor N (%)	Total N (%)
<i>P. papatasi</i>	1044 (33.4)	541 (31.0)	193	581 (44.63)	1004 (28.13)	1585 (32.54)
<i>P. kandelakii</i>	767 (24.5)	648 (37.2)	118	278 (21.35)	1137 (31.86)	1415 (29.05)
<i>P. sergenti</i>	687 (21.9)	272 (15.6)	253	318 (24.43)	641 (17.96)	959 (19.69)
<i>P. major</i>	398 (12.7)	107 (6.1)	372	36 (2.76)	469 (13.14)	505 (10.37)
<i>P. caucasicus</i>	221 (7.1)	105 (6.0)	210	83 (6.37)	243 (6.81)	326 (6.69)
<i>P. ansarii</i>	6 (0.2)	62 (3.5)	9.7	6 (0.46)	62 (1.74)	68 (1.4)
<i>P. halpensis</i>	3 (0.1)	1 (0.6)	300	0	4 (0.11)	4 (0.08)
<i>S. sintoni</i>	5 (0.16)	0 (0)	-	0	5 (0.14)	5 (0.1)
<i>S. dentata</i>	0 (0)	4 (0.23)	-	0	4 (0.11)	4 (0.08)
Total	3131 (100)	1740 (100)	180	1302 (26.73)	3569 (73.27)	4871 (100)

Among the sandflies collected from indoor places in Hamadan city (24.43%) *Phlebotomus sergenti* is ranked second and is known as the main vector of urban cutaneous leishmaniasis in Iran [5, 7].

The species of *Phlebotomus major* and *Phlebotomus kandelakii* were caught from indoor and outdoor places in different under study areas and in some cities of Iran, visceral leishmaniasis (Kala-Azar) is viewed in these species sporadically and as leptomonad infection [16]. It seems also important to consider these species in Hamadan city. Since sandflies are vectors of cutaneous leishmaniasis or oriental sore (urban, rural) and Kala-Azar (mucocutaneous leishmaniasis has not been observed in Iran so far). It is very important to eliminate these insects to reduce cases of disease. Therefore, this insect must be controlled. It is recommended to eliminate rodents, especially wild rodents, at least 300-500 meters around the infected villages and residual spraying along with rodenticide continuously and regarding Kala-Azar reservoir, to eliminate dogs and wild carnivorous. Given the frequency of sand flies, particularly species of *Phlebotomus papatasi* and *P. sergenti* and scattered

reports of variety of cutaneous leishmaniasis (imported from elsewhere) in this city, in order to prevent possible transmission of diseases and reduce harassment of this insect during warm months of year, personal protection such as use of mosquito nets, application of window and door mesh and use of repellents are recommended.

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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