Original Article

A PRELIMINARY ENTOMOLOGICAL SURVEY FOR ECTOPARASITES ON RODENTS IN ANDAMAN AND NICOBAR ISLANDS, INDIA

Amruthraj Radhakrishnan[1] and I.P. Sunish[2]

[1]Central International Health Division, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, New Delhi- 110011

[2]ICMR-Regional Medical Research Centre, Port Blair 744 103

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ABSTRACT

Background: Rodents play an important role as hosts for ectoparasites, which act as reservoirs for various pathogens (especially rickettsia causing scrub typhus) that cause disease in humans and other animals. Risk assessment and study on the rodent ectoparasite diversity can guide the health authorities in prioritizing prevention and control programmes, targeting rodents and their ectoparasites. In this study, the abundance and distribution

*Corresponding Author:

Dr I.P. Sunish; E-mail: sunish67@yahoo.com

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of rodents and their associated ectoparasite population were determined, in selected sites of South Andaman District, Andaman and Nicobar archipelago.

Methods: Live rodents were trapped using Sherman and Wonder trap. Ectoparasites were collected by combing the trapped rodents and identified to species level following standard taxonomic keys.

Results: A total of 18 rodents were collected from 88 traps, set in six locations. The rodents trapped during the survey were *Rattus rattus* (44.4%), and *R. norvegicus* (55.6%). A total of 1369 ectoparasites were collected. The study identified one species of chigger mite, *Ascoschoengastia indica*. Among the trapped rodents, 55.6% were positive for ectoparasites, and 34.3% of the total ectoparasite fauna were chigger mites.

Conclusion: Preliminary investigation of the ectoparasite of rodents, identified one species of chigger mite. The study suggests the need for a much more extensive survey with a larger sample size to determine the ectoparasite diversity in the islands with respect to their environmental and ecological habitation.

Keywords: Andaman and Nicobar Islands, *Ascoschoengastia indica*, Chigger, Rodents, Scrub Typhus

INTRODUCTION

Rodents play an important role as hosts for ectoparasites and reservoirs for various pathogens that cause zoonotic diseases in humans and other animals[1, 2]. The close interaction of rodents with humans and domestic animals is a risk factor for the transmission of pathogens causing diseases like; plague, leptospirosis, salmonellosis, rat-bite fever, leishmaniasis, Chagas' disease, Omsk haemorrhagic fever, scrub typhus, murine typhus, Lassa fever[3], and Crimean Congo Haemorrhagic Fever[4,5]. These zoonotic disease pathogens can be transmitted from rodents to humans through ectoparasites, such as mites, ticks, and fleas.

Rodent surveys are carried out to gather information on the diversity and distribution of rodents and their ectoparasites that poses a risk of zoonotic disease transmission in an area[6]. The parasitic fauna on rodents varies across geographical areas. The current trend of urbanization and agricultural patterns across the globe raises concerns about the emergence and re-emergence of zoonotic diseases[7]. Risk assessment and study on rodent ectoparasite diversity can facilitate the health authorities in prioritizing prevention and control programmes, targeting rodents and the ectoparasites harbouring them[8].

In recent years, there has been a resurgence of scrub typhus in diverse ecological settings across India[9]. However, information on its host and vectors from Andaman and Nicobar Islands is lacking. In view of this, a preliminary investigation was undertaken to determine the abundance of rodents and their ectoparasites, including mites, in selected sites in the South Andaman District.

MATERIALS AND METHODS

Study area

The study was carried out in the South Andaman district, Andaman and Nicobar archipelago. The island experiences a hot and humid climate with an average annual rainfall of 3100 mm. About 95 percent of annual rainfall is received during May-December. The mean relative humidity in these Islands is 79%, and the mean maximum and minimum temperatures are 30.2° C and 23.0° C respectively. Out of twelve months in a year, these islands experience wet conditions for 8 months and dry conditions during the remaining 4 months[10].

The study was carried out in six randomly selected areas, *viz.* Chidiyatappu, Bambooflat, Haddo, Garacharma, Brookshabad, and Shadipur. The study was carried out during the months from November 2019 to January 2020.

Collection of rodents

Live traps were used to collect rodents. Sherman traps (size = 3" × 3" × 10") and wonder traps were used to capture live rodents. In each selected site, traps (10 to 15 nos.) were placed in peri-domestic areas, with scrub vegetation and rodent burrows. These were baited with coconut, dry fish, and peanuts. Traps were set one

hour prior to sunset (16:30 h) and retrieved in the morning (05:00 h), the next day. The trapped rodents were anaesthetized and identified using standard taxonomic keys[11]. The work was approved by the animal ethics committee of the institute (Project No. 2019-5056/F69; dated 23rd September 2019).

Ectoparasite collection and processing

The ectoparasites (including chigger mites) were collected by combing the rodents against the fur over a white enamel tray. Various regions of the animals, *viz.* snout, ears, limbs, and axillary were combed using a fine-toothed brush, and ectoparasites were collected and preserved in ethanol (70%), until the slide preparation. Mites and other ectoparasites were mounted on slides in Hoyer's medium[12], and identified to species, using standard taxonomic keys[13,14].

In each study site, the trap positivity rate was estimated from the rodents captured per trap. As the chigger index for scrub typhus helps in the estimation of vector density in the area, this index was calculated from the number of chigger mites per rodent host.

RESULTS AND DISCUSSION

During the study, 18 rodents were collected from 88 traps from six sites (Table 1). The trap positivity rate ranged from 0 to 41.7% in different study sites and the overall positivity rate was 20.5 %. Trap positivity was found to be 20% and 22.2% for Sherman and wonder traps respectively. Among 18 rodents collected, 55.6% were positive for ectoparasites. Of the 6 study sites, rodents were not captured from 2 sites. The rodents collected in the survey belonged to Rodentia - *Rattus rattus* (44.4%), and *Rattus norvegicus* (55.6%). Ectoparasites from rodents were collected in three sites, viz, Bambooflat, Haddo, and Brookshabad. A total of 1369 ectoparasites were collected (Table 1). Other ectoparasites like *Ornithonyssus* sp. and *Polyplax* sp. lice were also recorded during the study.

Adult mites were the most abundant and formed 65.52% of the total ectoparasite fauna sampled, followed by chigger mites accounting for 34.25%. The adult mites collected during the study belonged to the genus *Laelaps* sp. Chigger infestation in the collected rodents was 20% and 80% for *R. rattus* and *R. norvegicus* respectively of which the Chigger index (all trombiculid mites) was

highest (40.1) for *R. norvegicus,* while it was 8.5 for *R. rattus.* The chigger index for the study area varied from 13.6 (Brookshabad) to 44 (Bamboflat) (Table 1). *Ascoschoengastia indica* (a potential vector of tsutsugamushi disease) was the only species of chigger mites identified during this study.

This is the first study on the prevalence of rodent ectoparasites (including mites) of medical importance in the Andaman and Nicobar Islands. Rodent ectoparasites play an important role in disease transmission to humans and animals. Determining the common rodent species occurring locally and ectoparasites harbouring them is significant in the prevention and control of disease transmission to humans. The presence of disease-causing pathogens for scrub typhus and other ectoparasite-borne diseases in the animals, along with the presence of ectoparasite/vectors above the threshold level can increase the risk of disease transmission in an area. Enzootic maintenance of pathogens in the rodent host has been demonstrated earlier[15,16]. Eco-entomological aspects of these ectoparasites and their host need to be studied extensively, to identify the risk factors associated with disease transmission, in order to initiate public health response. In the present study, the highest catch rate was for *R. norvegicus,* which harboured chigger mites; i.e., *Ascoschoengastia indica.*

In conclusion, during the present study, 55% of the total rodents trapped had the presence of ectoparasites, and the chigger index was found to be 26.1. However, this study suggests that the infestation and seasonal fluctuation of chigger mites in the rodent population of the Andaman and Nicobar islands needs to be studied extensively. There were a few limitations in this study. The rodent sample size was smaller and was not examined for rickettsial antibodies. More sites in different islands of the Andaman and Nicobar archipelago could have facilitated the identification of more mite islands and scrub typhus foci if any.

Table 1. Rodent and ectoparasites collected from the study sites

Study sites	Number of traps (% +ve)		Trap positivity (%)	Rodents collected / species	Rodents +ve for ectoparasite / total collected	Ectoparasites collected			
	Sherman	Wonder				Chigger mite (*A. indica*) / Chigger Index	Adult mite (*Laelaps* sp.)	Lice	Other
Chidiyatappu	10 (0)	2 (0)	0	0	0/0	0/0	0	0	0
Bamboflat	10 (0)	4 (50)	14.3	2*	1/280	88/44	191	0	1
Haddo	20 (35)	6 (33.3)	34.6	8*	7/970	313/34.7	657	0	0
				1**	0/0	0/0	0	0	0
Garacharma	10 (20)	2 (0)	16.7	2**	0/0	0/0	0	0	0
Brookshabad	10 (50)	2 (0)	41.7	5**	2/119	68/13.6	49	1	1
Shadipur	10 (0)	2 (0)	0	0	0/0	0/0	0	0	0
Total	**70 (20)**	**18 (22.2)**	**20.5**	**18**	**10/1369**	**469/26.1**	**897**	**1**	**2**

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