



DETECTION OF PARASITES FROM THE EXTERNAL BODY SURFACE OF COCKROACHES IN FEMALE HOSTELS OF AHMADU BELLO UNIVERSITY ZARIA

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ABSTRACT

Cockroaches are the most abundant non-biting insect pests in residential buildings, hospitals, hostels, hostels and restaurants. They feed on varieties of materials including sewages and garbage and so have copious opportunities to disseminate human pathogens. This study evaluated the presence of parasite on cockroaches found in two female hostels in Ahmadu Bello University, Zaria. A total of 100 cockroaches were collected, 25 from rooms and toilets of both hostels. The samples collected were examined using simple sedimentation technique. Normal saline was used in the washing and examination of the external surfaces. About 48 of the total cockroaches examined harboured parasites giving a total occurrence of 48%. About 80% and 40% of the cockroach collected from the toilets and rooms were found to harbor some ova and cysts of some human and animal parasites on their external body surfaces. Some of the parasites detected in the study were ova of *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Hymenolepis nana*, oocyst of *Isospora belli*, rhabditiform larva of *Strongyloides stercoralis* and oocysts of coccidian. This study revealed that cockroaches represent a vehicle of transmission of possible pathogens and can be an important vector in the transmission diseases to man. Therefore control of cockroach population in our environments is important so as to curb the menace caused by these parasites.

Keywords: cockroaches, detection, external body surface, hostels, parasite

INTRODUCTION

Cockroaches also called roaches or steam bugs found in different parts of the world are important disease-causing organisms and are therefore of public health concern. There are over 4,500 known species of cockroaches, but only 30 are considered as pest, of which *Blattella germanica* (German cockroach), *Blatta orientalis* (Oriental cockroach), *Periplaneta americana* (American cockroach), *Periplaneta australasiae* (Australian cockroach), and *Supella longipalpa* (brown-banded cockroach) are the commonest and of public health importance (Shahraki *et al.*, 2013; Nuwer, 2013; Sarwar, 2015).

Cockroaches aid in the mechanical transmission of various pathogenic viruses, bacteria and protozoans and are common pest in homes, restaurants, hospitals, warehouses, offices and in storage areas (Piper and Antonelli, 2012). Cockroaches are nocturnal and remain hiding in dark and warm areas especially in narrow spaces and corners crawling and traveling along the edges of walls or other surfaces thereby contaminating food and eating utensils, destroy fabric and paper products, and impart stains and unpleasant odors to surfaces they come in

contact with their faeces and foul-smelling secretions (Bassam, 2013; Sarwar, 2015; Adenusi *et al.*, 2018). Their faeces, salivary gland excretions and even the dead cockroaches have been implicated in the spread of food poisoning (Tsigereda *et al.*, 2018), and infectious diarrhoea such as cholera, typhoid fever, dysentery, leprosy and plague (Gehad *et al.*, 2011; Iboh *et al.*, 2014). Indoor infestations by this vector is an important cause of allergy thereby increasing the risk of asthma and asthma related health problems in some populations (Bala and Sule, 2012; Sarwar, 2015).

Studies have shown that cockroaches also act as vectors for the spread of parasitic disease by carrying the infective stage of the parasite such as the helminths eggs which include *Ascaris lumbricoides*, *Strongyloides stercoralis* and *Trichuris trichiura* which causes helminthiasis and can cause severe illnesses in human. They also act as vectors in transmitting protozoan cysts such as *Cryptosporidium spp.*, *Giardia spp.*, *Entamoeba histolytica* and *Entamoeba coli* (Bala and Sule, 2012; Iboh *et al.*, 2014; Yusuf, 2018; Auta *et al.*, 2019).

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There is an unprecedented increase in cockroach population in public places all over the world, posing a serious risk to human health especially children who are more at risk of malnutrition due to repeated exposures and persistent diarrhoea or gastroenteritis associated with the parasites harboured by these vector.. These cockroaches are also of public health importance as they lead to losses due to increased cost of medical and health care and indirect losses from stress, absenteeism and reduced productivity. There is therefore the need to check for the presence of parasite on cockroaches in order to assess the level of infestation of this parasite in the study area. The findings may be of immense benefit to the residents of the hostels and other areas within and outside the university community where this study was conducted as it will help to educate them on the dangers pose by the presence of cockroaches in their environments and plan a strategic effort to control the population of cockroaches in the country.

MATERIALS AND METHODS

Study Area

The research was conducted in 2 female undergraduate hostel (A and B) located at the main campus of Ahmadu Bello University which is a tertiary institution located in Zaria, Kaduna State, Nigeria. The state is located in the central part of Northern Nigeria, which shares common boundaries with Katsina, Kano, Bauchi, Nassarawa, Federal Capital Territory, Niger and Plateau states. The state is located in the Northern Guinea Savannah of the vegetation zones between latitudes 9⁰ and 12'N and longitude 6⁰E and 9'E of the prime meridian. The institution has up to six different hostels which are undergraduate male and female hostels as well as postgraduate male and female hostels. The institution is the largest and most populated University in Nigeria. Hostel A has 9 blocks, each block has 49 rooms divided into 4 floors, each floors has 3 toilets and 2 bathrooms and each of the rooms has 6 occupants. Hostel B has 11 blocks and each block has 4 floors, each of the block has 51 rooms, 2 toilets and 3 bathrooms. There are also 6 occupants in each room.

Sample collection

This research was centered on two undergraduate female hostels (A and B) in the institution. A total of 100 cockroaches were collected from the two hostels. Two cockroaches was collected per block and per toilet in both hostel. The samples were collected at night as they crawl out of their hidden places aseptically in a plastic container and labelled appropriately. Of the 100 samples, 50 were obtained from the

toilets of both hostel comprising of 25 from each of the toilet while the remaining 50 were obtained from the room of both hostel .each cockroach was preserved in a labelled sterile vial containing cotton wool soaked in 10% chloroform and transported to the Department of Entomology and Parasitology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria.

Examination of Cockroach from External Body Surface

A cotton ball was soaked in chloroform and added into the airtight container to weaken and kill the cockroaches. After the cockroaches were killed, all of them were processed immediately to observe for any pathogens carried on the external body surface areas by sedimentation technique. Each sample was placed in a test tube containing 5mls of normal saline. The test tube was shaken vigorously for 20 minutes to detach any parasite from the external body surface of the cockroach. The fluid was transferred to a centrifuge tube and centrifuged at 3000 rpm for 5minutes The supernatant was decanted and a portion of the sediment was picked using Pasteur pipette onto a clean grease-free glass slide and then covered with a cover slip and examined under x10 and x40 objectives, another portion of the sediment was examined in a drop of Lugol's iodine for protozoan cysts. The sediments and Lugol's iodine were mixed thoroughly using another sterile Pasteur pipette before it was covered with cover slip. The slide was examined under light microscope under a total magnification of 100x and 400x. (Cheesebrough, 2006; Yusuf, 2018). Parasites were identified using standard taxonomical key.

Statistical Analysis

Data obtained from the study were presented in tables and the detection rate and or prevalences obtained were expressed in percentages.

RESULTS

Medically important parasites were identified at 48% occurrence from the external body surface of cockroaches in the study area. The differences in infestation level recorded in the rooms and toilets were different with cockroaches captured in the toilets having the higher percentage of 80% and 60% than those captured in the rooms 40% and 12% in hostels A and B respectively (Table 1).

The parasites found on the external body of cockroaches in this study were ova of Hookworm, *Ascaris lumbricoides*, *Aspicularis* and *Hymenolepsis nana*, oocyst of *Isospora belli* and coccidian, larva of *Strongiloides stercoralis*, and nematode larva. More parasites were seen in

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hostel A (Table 2) as compared to hostel B (Table 3). The ova of hookworm and larva of nematode had the highest prevalence of 24%, followed by coccidian oocyst (20%) while Ova of *Aspicularis* had the lowest prevalence in the

cockroaches found in hostel A toilet. In hostel B toilet, *Isospora belli* and ova of hookworm the lowest (4%) and the highest (32%) prevalence respectively (Table 2 and 3).

Table 1: Detection Rate of Parasite on Cockroaches in the two Selected Female Hostels

Hostels	Location	Number. Examined	Number. Positive with Parasites (%)
A	Rooms	25	10 (40%)
	Toilets	25	20 (80%)
B	Rooms	25	3 (12%)
	Toilets	25	15 (60%)
Total		100	48 (48)

Table 2: Percentage Occurrence of Parasites found in Cockroaches obtained from Hostels A

Location	Parasites found	Number of found (% occurrence)
Toilets	Ova of <i>Aspicularis</i>	2 (8)
	Larvae of <i>S. stercoralis</i>	3 (12)
	Mite	3 (12)
	Oocysts of coccidian	5 (20)
	Nematode larva	6 (24)
	Ova of hookworm	6 (24)
Rooms	Mite	3(12)
	Oocysts of coccidian	10(40)
	Nematode larva	12 (48)

N= 25

Key

N= no of cockroaches obtained in each location

Table 3: Percentage Occurrence of Parasites found in Cockroaches obtained From Hostel B

Location	Parasites found	Number of found (% occurrence)
Toilets	Ova of <i>Aspicularis</i>	4 (16)
	<i>Isospora belli</i> oocysts	1 (4)
	Hookworm ova	8 (32)
	<i>H. nana</i> ova	3 (12)
	<i>A. lumbricoides</i> ova	2 (8)
	Larvae of <i>S. stercoralis</i>	2 (8)
	Mite	2 (8)
	Coccidian oocysts	3 (12)
Rooms	<i>Aspicularis</i> ova	1(4)
	Mite	14 (4)
	Pseudoparasites	10 (4)

N= 25

Key

N= no of cockroaches obtained in each location

DISCUSSION

Medically important parasites were identified from the external body surface of cockroaches in the study area. The level of infestations of the cockroaches by the parasites and the percentage of each parasite found in the study area were recorded. Reports from different parts of the

world such as those reported by Yusuf (2018) in Malaysia, El-Sherbini and El-Shaebini (2011) in Egypt, Atiokeng *et al.* (2017) in Camerron, Getachew *et al.* (2007), Sulaimon *et al.* (2015) and Oyetunde *et al.* (2016) in Nigeria, has also shown that different stages of parasites were haboured by cockroaches.

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The prevalence obtained in the study is however lower than previous studies conducted in Nigeria such as 77.5% reported by 67% reported by Ajero *et al.* (2011) in Owerri, Bala and Sule (2012) in Sokoto, 95.33% reported by Iboh *et al.*, 2014 in Cross River, 96.4%, reported by Adenusi *et al.* (2018) in Lagos, 84.3% reported by Alaku *et al.* (2018) in Nassarawa and 94.0% reported by (Auta *et al.* 2019) in Dutsin-Ma, Katsina. The differences in prevalence obtained in these study and earlier studies may be attributed to housing type, sampling sites, sanitation and environmental hygiene since these vectors tend dwell in places with poor hygiene and sanitary conditions. The reduced prevalence observed in our study might be as a result of the sampling sites as most of the previous studies collected these vectors from slums, while the present study was conducted in University hostels where students are constantly been sensitized about the dangers of cockroaches in their environment, also student in tertiary institution are more likely to practice personal and environmental hygiene. It may also be attributed to constant fumigation exercise carried out in the university environment.

The higher detection rate of the parasites in cockroaches found in the toilets compared to those in the room may be due to contact with faecally contaminated material and surfaces as most of these parasites are harboured in faeces of infected persons and this may also be a source of transmitting the parasites as they move to other places and surfaces to search for food and or lay their eggs thereby infecting these surfaces they come in contact with. The higher

parasitic load found in toilet in the study is in agreement with the finding of Auta *et al.* (2019) in Dutsin-Ma town of Northwestern Nigeria and Atiokeng *et al.* (2017) in Cameroon.

The lifestyles of the students in both hostels are similar, so the reduction in the prevalence reported in hostel B may however be attributed to the recent renovation exercise that took place in the Hostel. Paint and sprays used during the exercise may have helped to kill and displaced the vectors thereby sanitizing the environment, reducing the cockroach population and reducing cross-contamination by other vectors. Sulaimon *et al.* (2015) linked his findings to longer duration of human habitation and activities in the campus and also unsanitary condition of the hostels, Onyido *et al.* (2009) also observed that Nigeria Universities were known to be overcrowded with more than twice the number of students expected to occupy the rooms and this aids the high populations of cockroach in the hostels environment.

CONCLUSION

This study has shown that cockroaches are important reservoir of parasites of both medical and veterinary importance. Plans should be put in place to reduce or eliminate cockroaches which can increase the cost of medical and health care resulting in economic losses in the country. Fumigation of the hostels by the relevant authorities should be done frequently, awareness campaign and education of the populace on the dangers posed by these vectors should also be encouraged so as to curb the menace associated with vector.

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