

VECTORIAL CAPACITY OF COCKROACHES IN TRANSMITTING PARASITES OF MEDICAL IMPORTANCE IN HOSTELS OF WAZIRI UMARU FEDERAL POLYTECHNIC, BIRNIN KEBBI, KEBBI STATE, NIGERIA.

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ABSTRACT

This study was conducted to determine the capacity of cockroaches as vector of parasites of medical importance in hostels of Waziri Umaru Federal Polytechnic. 100 cockroaches identified as *Periplaneta Americana* were collected from different locations of the hostels using sweep net. These were examined for the presence of human parasites using standard parasitological techniques. The result revealed six parasites of medical importance including *Entamoeba histolytica* (41.0%), *Ascaris lumbricoides* (29.0%), *Entorobius vermicularis* (16.50%), *Schistosoma mansoni* (8.50%), *S. haematobium* (2.61%) and *Trichuris trichura* (2.39%). There was significant

Introduction:

Cockroaches are considered the most potential contributors to health peril for individuals or the public due to their capacity to transmit parasites and other pathogenic microorganisms (Siagian *et al.*, 2018). They are the most obnoxious and abundant non-biting insects found in homes, hospitals, hostels and restaurants (Bala and Sule, 2012). They feed on garbage and sewage and so have ample opportunities to spread human

difference ($p < 0.05$) in the isolates between the stages of development of the cockroaches with more adult cockroaches (89.6%) harbouring parasites than the nymphs (34.8%). There was no significant difference ($p > 0.05$) observed between the sexes. Cockroaches remain an important reservoir for infectious pathogens. Therefore control measures administered in the various hostels and the surrounding, and targeting especially the adult stages of the vectors will help to reduce the menace of the spread of parasitic pathogens in the study area.

Keywords: Cockroaches, Vectors, Parasites, Medical, Hostels

Pathogens. Also, their nocturnal and filthy behaviours made them suitable carriers of various pathogenic microbes (Allen, 1987; Cotton *et al.*, 2000; Pai *et al.*, 2005). Some parasites have been found in the external and internal body parts of cockroaches. Studies have also revealed that contact with cockroach antigens may play an important role in asthmatic bronchitis related health challenges (Montessor *et al.*, 1998). Recently, cockroach infestations have been on the increase across the world and especially in Nigeria where the risk of cockroaches to human health has been reported (Bala and Sule, 2012; Nazari, *et al.*, 2016). They are abundant in many homes in Nigeria where live like “co-tenants” or “landlords”.

Cockroaches are indiscriminate feeders and oftentimes subsist on human faeces thus can serve as potential carriers of intestinal parasites, fungi and bacteria if such faeces are infected. The role of cockroaches in the transmission of parasites like *Entamoeba histolytica*, *Toxoplasma gondii*, *Sarcocystis*, *Gardia lamblia* and other protozoan parasites has been emphasized (Ajero *et al.*, 2011). Poverty, poor environmental hygiene and impoverished health services have been implicated as predisposing factors to cockroaches infestation (El-Sherbini and Gneidy, 2011).

This study was therefore, designed to isolate parasites from the body surface of cockroaches found in male and female students’ hostels of Waziri Umaru Federal Polytechnic, Birnin Kebbi, Kebbi State, Nigeria. The findings

will be great benefits to the institution and the country at large as it will help to enlighten them on the potential dangers of having cockroaches in their hostels and their homes. The findings will also reveal the parasites possibly transmitted by cockroaches, and stir up authorities to find ways of controlling cockroach infestation.

MATERIALS AND METHOD

Study Area

The study was carried out in Waziri Umaru Federal Polytechnic, Birnin Kebbi located on Latitude 12° 27' 57.8 N and Longitude 4° 11' 58.3 E. This area enjoys both hot and cold season, rainy season and dry season. The cold season lasts between November and March, while the hot season occurs between March and June. The rainy season is short, experienced from June to October while the long dry season spans from October to May. The students in Waziri Umaru Federal Polytechnic are dominated by Hausa-Fulani and a mixture of other tribes including Igbo, Yoruba, Idoma, Nupe, Igala, etc.

Sample Collection

A total of 100 cockroaches were caught from different locations (refuse dumps, toilets and rooms in both toilets, using sweep net. Each cockroach caught was placed in sterile sample bottle and was transported to the Biology Laboratory of Waziri Umaru Federal Polytechnic for analysis. The sex, developmental stage and specie were determined using taxonomic keys.

Isolation and Identification of Parasites

Each cockroach was placed in a test-tube containing 2ml of normal saline. The test tube was shaken vigorously for two minutes to detach any parasitic stage attached to the body of the cockroach. Thereafter, the transferred into a centrifuge tube and centrifuged at 3000rpm for 5 minutes. The supernatant was discarded and the residual deposit was placed on a glass slide, covered with a cover slip, stained with Lugol's

iodine and viewed under the microscope using x40 objective lens. Parasite stages encountered were identified according Cheesbrough (1998).

Statistical Analysis

Descriptive statistics was used to analyze the data. Chi square was used to test the significance of the distribution. Significance level was maintained at 0.05.

RESULTS

All the 100 cockroaches were identified as *Periplaneta Americana*. 49 were male while 51 were female; with 77 adults and 23 nymphs. The results showed that out of the 100 cockroaches examined, 77(77.0%) were found to be carrying different stages of parasite species. The parasites encountered include the cyst of *Entamoeba histolytica*, ova of *Ascaris lumbricoides*, eggs of *Enterobius vermicularis*, *Schistosoma mansoni*, *S. haematobium* and ova of *Trichuris trichura* with 41.0%, 29.0%, 16.50%, 8.50%, 2.61% and 2.39% respectively (Figure 1). Female cockroaches harboured more parasites (86.2%) than the males (67.3%). The difference was not statistically significant ($p>0.05$) while in relation to the insect stages, adult cockroaches harboured more parasites (89.6%) than the nymphs (34.8%). The difference was statistically significant ($p<0.05$) (Table 1). 50 cockroaches were collected from each hostel, male and female. The result also showed that cockroaches collected from male hostels significantly harboured more parasites than those collected from the female hostels ($p<0.05$) with prevalence of 90.0% and 46.0% respectively (Table 2).

Table 1: Occurrence of medically important parasites by sex and developmental stage of cockroaches in the study area

Category	No. Examined	No. Infected	Prevalence (%)	p-value
Sex				
Male	49	33	67.3	0.4165
Female	51	44	86.2	
Total	100	77	77.0	

Stage				
Adults	77	69	89.6	0.0286
Nymph	23	8	34.8	
Total	100	77	77.0	

Table 2: Distribution of contaminated cockroaches in relation to the hostels

Hostel	No. Examined	No. Infected	Prevalence (%)	p-value
Male	50	45	90.0	0.0379
Female	50	23	46.0	
Total	100	77	77.0	

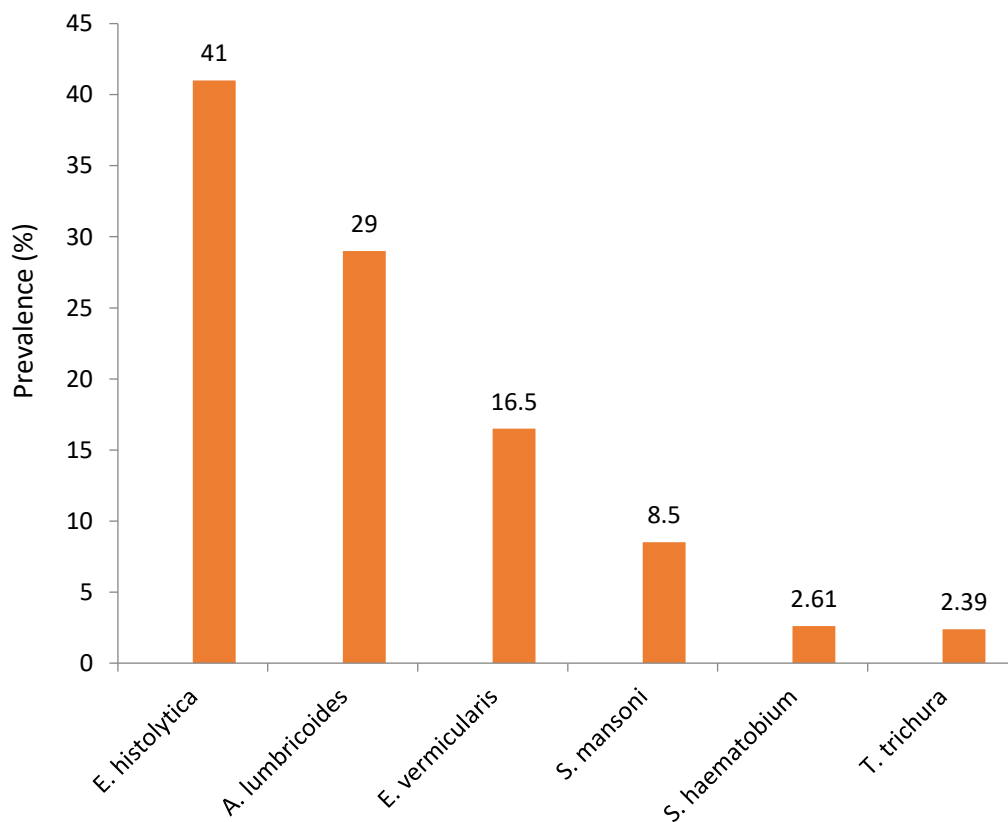


Figure 1: Recovery rate of parasites from cockroaches in the study area

DISCUSSION

Cockroaches have been implicated as irritant pests whose actions have negative effect on humans. One of the critical impacts on human and of public health concern is their capacity as potential carriers of pathogens, including parasites. Previous studies from other parts of Nigeria (Bala and Sule, 2012; Oyeyemi *et al.*, 2015; Adenusi *et al.*, 2018) and elsewhere (Al-Mayali and Al-Yaqoobi, 2010; Tatang *et al.*, 2017; Yusof, 2018) had revealed that cockroaches caught from human dwellings harboured a number of human intestinal parasites. Results of the present study, which show clearly that the cockroach species *Periplaneta americana* from students' hostels in Waziri Umaru Federal Polytechnic, Birnin Kebbi, Nigeria, harboured human intestinal parasites on their body surfaces show that, concerns over their potentials or roles as mechanical vectors cannot be disregarded.

This study revealed an overall prevalence of 77% which is similar to the findings of Bala and Sule (2012) who reported 77.52% prevalence from Arkila in Sokoto State, but lower than 98% and 100% reported by El-Sherbini and Gneidy (2011) and Kassiri and Kazemi (2012) respectively. It is however, higher than 47.39% and 67% obtained by Tatang *et al.*, 2017 and Chan *et al.*, 2004 respectively. These differences may be due to variation in the hygiene level of the residents of the various study areas since it has been observed that the lower the hygiene level of a place, the more possibility for cockroaches to come in contact with contaminated objects (Yusof, 2018; Okafor-Elenwo, 2014).

Entamoeba histolytica and *Ascaris lumbricoides*, responsible for amoebiasis and ascariasis respectively, were the most prevalent parasites in the cockroaches in this study. This could be because of the resistance bestowed on the cyst wall of *E. histolytica*, and the fact that *Ascaris* eggs have an inner shell layer of lipoprotein nature, which enable them to withstand harsh environmental conditions and be picked up by the roaches (Bala and Sule, 2012; Tatang *et al.*, 2017).

The study also showed that female cockroaches harboured more parasites than the males. This is in consonance with the findings of Bala and Sule,

2012 who attributed it to the fact that the female roaches actively roam about in search for food and sites to lay eggs compared to the males and thus can readily come in contact with the parasites. The high presence of parasites in the adult roaches than the nymphs could also be attributed to the fact that the adults can cover more area through their ability to fly around the places and roam about compared to the nymphs who are wingless and do not readily move freely like the adults.

The high prevalence of the medically important parasites isolated from cockroaches caught from the male hostels than the female hostels suggests that the female students maintained a cleaner environment than their male counterparts and this predisposes the male students to parasitic infections than the female students in the study area.

CONCLUSION

Based on the findings from research it can be concluded that a high percentage of the cockroach population in the study area was contaminated. These in turn carry the infective matter on their body surface and can transmit the infection to the community, at the rate of 77.0%. Cockroaches represent significant pool for infectious pathogens and also transmit parasites; therefore, close contact of cockroaches with humans should be discouraged.

RECOMMENDATION

Since this report has shown the presence of parasites from the exoskeleton of cockroaches in a residential place of students, it is important to urgently institute control measures on these insects in the hostels through massive public health enlightenment/education on improving personal hygiene and the existing standard of environmental sanitation in the student hostels and the institution at large. Also, a further investigation on the association of parasites and microbes with cockroaches found in the larger Birnin Kebbi community is hereby encouraged.

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