IMPLICATION OF COCKROACHES AS VECTORS OF GASTROINTESTINAL PARASITES IN PARTS OF OSOGBO, SOUTHWESTERN NIGERIA.

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ABSTRACT: Cockroaches are one of the ubiquitous insects around human residential areas and their filthy habits make them to be potential carriers of pathogens. In this study, we document the potential health risks associated with cockroaches as mechanical vectors of medically important gastro-intestinal parasites in Osogbo, Southwestern Nigeria. The body surface and the faecal samples of the cockroaches collected from residential area and hospital vicinity were screened for the parasites between November 2011 and February 2012. Thirteen (23.63%) of the 55 cockroaches collected in residential area harboured gastro-intestinal parasites while 16 (35.55%) of the 45 cockroaches from hospital vicinity harboured parasites. Cysts / ova of six gastro-intestinal parasites namely cyst of *Entamoeba hystolitica*, cysts of *Balantidium coli*, ova of *Ascaris lumbricoides,* cyst of *E. coli, ova of Enterobius vermicularis* and ova of hookworm were encountered in the body surface and faecal samples of the cockroaches during this study. The cockroaches from hospital vicinity harboured more parasites (five out of six) than residential areas (four out of six) but the difference in parasite burden was not statistically significant ($p>0.05$). The promotion of hygienic conditions and periodical fumigation of the environment become imperative so as to control the population of cockroaches and reduce the health risks associated with their presence in the study area.

KEY WORDS: Cockroaches, residential area, hospital, gastro-intestinal parasites, health risks, Nigeria.

Gastro-intestinal parasites are transmitted through water, food and hand contamination with the infective ova, or cysts of the parasites (Mafiana et al., 2000; Montressor et al., 2002). The diseases caused by the parasites constitute serious public health problems mostly in developing countries which lack necessary arsenals to combat the infections (Anosike et al., 2006). Most of the diseases (Such as Ameobiasis, Giardiasis, Ascariasis among many others) have been reported to be responsible for chronic diarrhea, liver failure, intestinal disturbances and stunted growth in the affected individuals (Mbanugo & Abazie, 2002; Montressor et al., 2002; Sam-Wobo et al., 2006).

Cockroach is one of the insects adaptable to domestic life around human. Evolution has also conferred the insect with an advantage of avoiding frequent attacks from human due to its ability to survive in dark crevices coupled with nocturnal activities (Fortedor et al., 1991). Cockroaches have been reported to feed on faeces, human detritus and food stuffs, and they are therefore mostly

found in the toilets, cupboards and kitchens (Fortedor et al., 1991; Tatfeg et al., 2005; Salehhzadeh et al., 2007). These filth habits make them potential carriers of various pathogens including gastro-intestinal parasites.

As efforts are being geared towards reducing the public health burden of the gastro-intestinal parasites in the developing countries, proper understanding of the routes of contacting the parasites would be of immense relieve in planning effective control strategies. The present study was carried out to investigate the roles of cockroaches in disseminating gastro-intestinal parasites in two environmental settings; residential areas and the hospital vicinity in Osogbo, Southwestern Nigeria.

MATERIALS AND METHODS

Study area and sampling of cockroaches

Osogbo metropolis is the State Capital of Osun State and lies between longitude 4° 34'E and latitude 7° 46'N. The cockroaches were collected in three selected residential houses (hostels) and within the vicinity of Ladoke Akintola University Teaching Hospital, Osogbo and State Hospital Asubi-Aro, Osogbo. The cockroaches were collected from toilets, kitchens, cupboards and floor with glove and transported into sterile containers for laboratory analysis. The collection was done between 20:00 and 23:00 hours from November 2011 to February 2012. However, the only cockroach collected throughout the period of the study at State Hospital Asubi-Aro died within 24 hours of collection and was discarded from further analysis.

Parasitological analysis of the cockroaches

The cockroaches collected were kept in containers for 24 hours after collection. The cockroaches and their feacal samples within the period were transferred into new separate sterile containers for parasitological analysis. To each sample container, 2ml of formol saline was added and then spun at 2000rpm for 5minutes. The deposit was then transferred into a glass slide and stained with 1% Lugol's iodine. The stained slide was subsequently observed under microscope for the ova and cysts of the parasites. Ziehl Nelseen stain technique was also carried out on the deposit to check for the presence of *Cryptosporidium parvum* and *Cyclospora cayetenensis* in accordance with Cheesbrough (1993) and Tatfeg et al. (2005).

Statistical Analysis

The parasite burden in the body and feaces of the cockroaches in the two environmental settings were subjected to statistical analysis using t-test.

RESULTS

Of the 100 cockroach samples collected, 55 were collected from the residential areas while 45 were collected within the hospital vicinity. Thirteen (23.63%) of the 55 cockroaches collected in residential area harboured gastro-intestinal parasites while 16 (35.55%) of the 45 cockroaches from hospital vicinity harboured parasites (Table 1). Cysts and ova of six gastro-intestinal parasites namely cyst of *Entamoeba hystolitica*, cysts of *Balantidium coli*, ova of *Ascaris lumbricoides,* cyst of *E. coli, ova of Enterobius vermicularis* and ova of Hookworms were encountered in the body surface and faecal samples of the cockroaches during this

study. All the six parasites were found in the body surface of the cockroaches while only cyst of *E. coli* was found in the faecal samples.

The cockroaches from hospital vicinity had more parasite occurrence (five out of six) and burden than the residential areas (four out of six) but the differences in parasite occurrence and burden were not significant ($p>0.05$) (Figure 1 and Table 2). The parasite of *B. coli* was not found in the samples from hospital vicinity while *E. histolitica* and Hookworms were absent in samples from residential area. The ova of *A. lumbricoides* had the highest occurrence and parasite burden in the body surface of the cockroaches' positive for gastrointestinal helminthes in both residential and hospital vicinities. The mean parasite load ranged between 2-6.5 oval/cyst per cockroaches in residential areas while the mean parasite load was between 1.5 and 7.4 per cockroaches in the hospital vicinity.

DISCUSSION

The results from this study have demonstrated that cockroaches constitute serious public health threats in Osogbo metropolis apart from their destructive habits. All the parasites recovered from their body are of medical importance and have been implicated in many gastro-intesinal disorders. *Entamoeba species*, *B. coli*, Hookworm and *A. lumbricoides* have been reported to cause chronic diarrhea, liver complications and stunted growth in the affected people (Mbanugo & Abazie, 2002; Montressor et al., 2002; Sam-Wobo et al., 2006; Tatfeg et al., 2005; Anosike et al., 2006; WHO, 2008).

The higher percentage of the cockroaches harbouring gastro-intestinal parasites encountered in hospital vicinity is not a departure from the expected results as similar observations have also been reported elsewhere (Salehzadeh et al., 2007). Hospitals host patients suffering from different ailments and these cockroaches would have been contaminated during their nocturnal movements from one ward to another and to other areas including toilets (Fotedor et al., 1991; Salehzadeh et al., 2007). This emphasizes the significant role of cockroaches in the transmission of nosocomial infections.

The remarkable aspect of the results is however, the recovery of the major gastro-intestinal parasites (*Entamoeba* species and *Ascaris lumbricoides*) in cockroaches from residential areas. This observation arguably signifies the high burden of gastro-intestinal diseases and poor sanitary conditions of residential areas in Osogbo metropolis despite monthly environmental sanitation in the city as these cockroaches would have been contaminated through toilet facilities. The high occurrence of *A. lumbricoides* over other gastrointestinal parasites has also been well documented in human populations in different parts of Nigeria (Ogbe & Adu, 1990; Ogbe et al., 2002; Mafiana, 1995; Asaolu et al., 2002; Sam-Wobo & Mafiana, 2005) and the risk of its transmission has been associated with poor sanitary conditions (Asaolu & Ofoeze, 2003; Sam-Wobo et al., 2006). If our hypothesis of high disease burden of gastrointestinal infections in Osogbo metropolis is latter accepted through further investigations, the contamination of the cockroaches as observed in this study would undoubtedly worsen the epidemiological situation. These parasites can be easily spread by body contacts of the cockroaches with food items, eating and drinking utensils in the homes.

The marginal disparity in the number of the parasites encountered in the body surface in comparison with faecal samples could possibly be explained in two ways; it could be that the insects only have body contact with the parasites without ingesting them or the parasites were unable to survive in the intestines of the insects. Both reasons are valid when considering the fact that some of the ova/

cysts of the parasites encountered are sensitive to changes in environmental factors (Sam-Wobo & Mafiana, 2005).

In conclusion, we have reported the public health risks of cockroach as carriers of medically important gastro-intestinal parasites in Osogbo metropolis. We therefore recommend wholesome hygienic conditions of the residents of Osogbo metropolis since cockroaches only thrive in filthy environment. The periodic fumigation of the hospitals is also imperative so as to reduce the incidence and risks of nosocomial infections through mechanical insect disseminators such as cockroaches as our observation at the State Hospital Asubi-Aro revealed that the Management usually embarked on periodic fumigation of the vicinity. This would have perhaps accounted for the sole sample (which later died before laboratory analysis) collected in the vicinity of the hospital throughout the period of the study.

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LITERATURE CITED

Anosike, J. C., Zaccheaus, V. O., Adeiyongo, C. M., Abanobi, O. C., Dada, E. O., Oku, E. E., Keke, I. R., Uwaezuoke, J. C., Amajuoyi, O. U., Obiukwu, C. E., Nwosu, D. C. & Ogbusu, F. I. 2006. Studies on the Intestinal Worm (Helminthiasis) Infection in a Central Nigerian Rural Community. JASEM, 10 (2): 61-66.

Asaolu, S. O., Ofoezie, I. E., Odumuyiwa, P. A., Sowemimo, O. A. & Ogunniyi, T. A. B. 2002. Effect of water supply and sanitation on the prevalence and intensity of Ascaris lumbricoides among pre-school age children in Ajebandele and Ifewara, Osun State, Nigeria. Transactions of the Royal Society of Tropical Medicine and Hygiene, 96: 600-604.

Asaolu, S. O. & Ofoezie, I. E. 2003. The role of health education and sanitation in the control of helminth infections. Acta Tropica, 86: 283-294.

Cheesbrough, M. 1993. Protozoan: Medical laboratory manual for tropical countries, Vol. I, Low edn, Tropical Health Technology.

Fortedor, R., Bareijer, U. & Verma, A. 1991. Cockroaches (*Blattella germanica*) as carriers of micro-organisms of medical importance in hospitals. Epidemiology and Infection, 107: 181-187.

Mafiana, C. F. 1995. Intestinal Helminthiasis (with particular reference to Ascariasis) among school children in Ilewo-Orile, Ogun State, Nigeria. Nigerian Journal of Parasitology, 16: 47-53.

Mafiana, C. F., Sam-Wobo, S. O. & Akinsete, A. A. 2000. Epidemiology of Ascariasis in some rural communities in Ogun State, Nigeria. Global Journal of Pure Applied Sciences, 6 (1): 23-26.

Mbanugo, J. I. & Abazie, D. C. 2002. A comparative study of intestinal parasite infections of pregnant and non-pregnant women in Nkpor, Anambra State. The Nigerian Journal of Parasitology, 23: 19-26.

Montressor, A., Crompton, D. W., Gyorkos, T. W. & Savioli, L. 2002. Helminth control in school-age children. A guide for managers of control programmes. World Health Organisation, Geneva 64 pages.

Ogbe, M. G. & Adu, O. O. 1990. Intestinal helminthiasis in an orphanage in Nigeria. Bioscience Research Communication, 2 (2): 105-118.

Ogbe, M. G., Edet, E. & Isichei, M. N. 2002. Intestinal helminth infection in primary school children in areas of operation of Shell Petroleum Development Company of Nigeria (SPDC), Western Division in Delta State, Nigeria. Nigerian Journal of Parasitology, 23: 3-10.

Salehzadeh, A., Tavacol, P. & Majhub, H. 2007. Bacteria, fungi and Parasitic contaminants of cockroaches in Public Hospitals of Hamedah, Iran, J. V. Borne Dis., 44: 105-110.

Sam-Wobo, S. O. & Mafiana, C. F. 2005. The effects of surface soil physio-chemical properties on the prevalence of helminths in Ogun State, Nigeria. University of Zambia Journal of Science and Technology, 9 (2): 13-20.

Sam-Wobo, S. O., Oyeyemi, O. A., Idowu, O. A. & Afolarin, A. 2006. Assessment of health knowledge and risk factors associated with intestinal helminthes in tertiary schools in Abeokuta, Nigeria. Nigerian journal of Parasitology, 27: 76-80.

Tatfeg, Y. M., Usuanle, A., Orukpe, A., Digban, A. K., Okodua, A., Oviasogie, F. & Turray, A. A. 2005. Mechanical transmission of pathogenic organisms: the role of cockroaches, J. V. Borne Dis., 42: 129-134.

WHO 2008. First Inter-Ministerial Conference on Health and conference in Africa: Health security through Health environment. IMCHE/1/p8.

Table 1. Distribution of gastrointestinal parasites in the body surface and faecal samples of cockroaches collected in residential and hospital vicinities in Osogbo, Nigeria.

Sampling sites	No of cockroaches examined	No positive (%)	No of parasites identified	
			Faeces	Body surface
Residential	55	13 (23.63)	1	4
Hospital	45	16 (35.55)	1	5

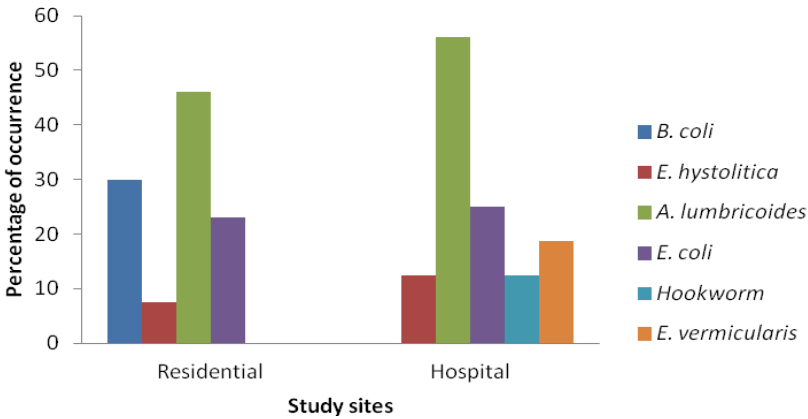

Figure 1. The prevalence of the parasites in cockroaches positive for gastrointestinal parasites in residential and hospital vicinities.

Table 2. Mean of the parasite ova/ cysts in the body of cockroaches collected in residential and hospital vicinities in Osogbo, Nigeria.

Parasites	Mean of the ova/ cysts of the parasite per cockroach	
	Residential	Hospital
Entamoeba hystolitica	2.0	1.5
Entamoeba coli	5.0	3.5
Balantidium coli	4.5	0
Ascaris lumbricoides	6.5	7.4
Hookworm	0	2.5
Enterobius vermicularis	0	2.5