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PARASITES ASSOCIATED WITH HOUSEFLIES FROM SOME DUMP SITES IN ILISAN AND IKENNE, OGUN STATE, SOUTHWEST NIGERIA

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ABSTRACT

The common synanthropic housefly (*Musca domestica*) frequents many filthy places such as dump sites where it picks diverse human pathogens, including parasites, which are eventually mechanically transmitted. Four hundred houseflies collected using baited traps from four dump sites near some food vendors in Ilisan and Ikenne towns, Ogun State, Nigeria, between April and June 2017, were examined parasitological using sedimentation technique. A statistically higher percentage (76.3%, 305/400) of the flies was positive for human parasites' ova/cysts ($P < 0.001$). Among positive houseflies, the percentages of occurrence of parasites' ova/cysts on the body surface in both Ilisan (86.8%) and Ikenne (86.4%) were statistically higher than in the intestinal tract ($P < 0.001$ in both cases). Parasites' ova/cysts recorded include those of *Ascaris lumbricoides*, Hookworm, *Enterobius vermicularis*, *Taenia* sp., *Fasciola* sp., and *Entamoeba histolytica*. *A. lumbricoides* (66.7% for Ilisan, 62.5% for Ikenne) had statistically highest prevalences of occurrence ($P < 0.001$ in both cases). The statistically commonest case of mixed parasites' species was *Ascaris* + Hookworm + *E. histolytica* (36.8%), followed by *Ascaris* + *E. histolytica* (24.1%) ($P < 0.001$). This study has shown that houseflies positive for ova/cysts of soil-transmitted helminths and some other human parasites are present and widespread in the study area. Prompt measures should be taken to check the population and breeding of houseflies, properly and sustainably manage dump sites, and educate the inhabitants of the study area.

KEYWORDS: Houseflies, dump sites, human intestinal parasites, soil-transmitted helminths**,** mechanical transmission, Nigeria.

INTRODUCTION

The common housefly, *Musca domestica* is a typical synanthropic fly in rural and urban areas worldwide[1] and its presence is often considered a sign of unhygienic condition.[2] Houseflies feed readily on human foodstuffs, sucking and vomiting, and defaecating.[1] However, their breeding sites are human and animal and a variety of organic debris of human origin.[3] Therefore, houseflies pick numerous and diverse human pathogens (including bacteria, fungi, viruses and parasites) in and on their bodies from their breeding sites, which are eventually mechanically transmitted by them to humans.[4]

Studies have revealed that in many developing countries, refuse dump sites are repositories of numerous industrial and domestic wastes including human faeces.[5-7] The filthiness of such neglected or improperly managed dump sites naturally attracts the filth-loving houseflies. Some recent reports on incrimination of *M. domestica* as mechanical carriers of human parasites from Nigeria abound in literature.[8-11] However, no such report on houseflies, particularly from dump sites, from Ilisan and Ikenne towns, Ogun State, southwest Nigeria is known to the authors.

In view of the established public health importance of houseflies, particularly vis-à-vis their incrimination in mechanical dispersion of human intestinal parasites, the present study was carried out to elucidate the human parasites carried by houseflies from dump sites in Ilisan and Ikenne, both in Ogun State, southwest Nigeria. It is hoped that the findings of this study will be beneficial towards the strategic control of human parasites and related pathogenic organisms transmissible through houseflies in the study area.

MATERIALS AND METHODS

Study area

The study was conducted in Ilisan and Ikenne towns both in Ikenne Local Government (ILG) area, Ogun State, southwest Nigeria. The towns lie in the rain forest belt, between Latitutes 7˚ 00′ and 7˚ 20′ N, Longitudes 3˚ 70′ and 3˚ 80′ E. The two towns lie opposite each other with

a major road (Lagos-Benin express way) between them. Ikenne is the headquarter town of ILG area, while Ilisan is the seat of Babcock University located equidistant between Ibadan and Lagos. The populations of the towns are composed majorly of the Yorubas, and a large number of Ibos and Hausas. Some of the inhabitants are Babcock University workers; some others are traders, artisans, civil servants and farmers. The towns are experiencing spontaneous increase in the number of refuse dump sites due to their fast rate of development.

Housefly sampling

Four different dump sites ranging from 100 meters to 120 meters away from nearby food vendors were selected in each of Ilisan and Ikenne towns for the study. The dump sites are located in different parts of each of the towns. Eight field bottle traps were made from disposable plastic water bottles. This was done by cutting off the top of each bottle and inverting it to form a cone leading into the body of the bottle. Baits composed of spoiling fruits, meat and food residues were placed in the body of each improvised bottle trap. At each of the study dump sites, a baited trap was placed on the ground out of traffic areas, for houseflies to be trapped.[12] Housefly sampling at each dump site was done for one hour between 9.00 hour and 10.00 hour, 2 - 3 times per week, between April and June 2017. All housefly samples collected during each working visit to the study dump sites were immediately taken to the laboratory for parasitological analysis.

Housefly samples examination

The parasitological analysis of the housefly samples was carried out using sedimentation technique. For parasites' ova/cysts on the body surface (BS), each housefly sample was washed in 5mL normal saline (0.85% NaCl solution) in a test tube. The resultant saline was concentrated by centrifugation at 2000 rpm for 5 minutes. The supernatant was decanted and the precipitate was placed on a glass slide, stained with 1 drop of Lugol's iodine.[13]

Subsequently, each housefly sample was dissected and the intestinal tract (IT) was removed and dissected in 5mL normal saline. The dissected intestine was centrifuged at 2000 rpm for 5 minutes. The supernatant was decanted and the precipitate was then transferred onto a glass slide, stained with 1 drop of Lugol's iodine.[13] Each of the wet mounts was observed under the light microscope for presence of parasites' ova/cysts using x10 and x40 objectives. Identification of the parasites' ova/cysts observed was done with reference to the identification chart of Sullivan.[14]

Statistical analysis

The chi-square ((χ^2) test was used to compare values related to abundance of houseflies, prevalence of parasitic infections and relative locations of parasites for significant differences.

RESULTS

The abundance of houseflies in the study dump sites in Ilisan and Ikenne is summarized in Table 1. There was no significant difference in the abundance of the houseflies among the dump sites in Ilisan ($\chi^2 = 6.0$, $P > 0.05$), and Ikenne ($\chi^2 = 3.78$, $P > 0.05$). Out of the total 400 houseflies examined, a statistically higher percentage (76.3%, 305/400) was positive for human parasites' ova/cysts, while a lower percentage (23.8%, 95/400) was negative ($\chi^2 = 27.53$, $P < 0.001$). The percentage occurrence of human parasites' ova/cysts in houseflies in Ilisan (64.5%) and Ikenne (88.0%) were statistically similar ($\chi^2 = 3.62$, $P > 0.05$). In Ilisan, the percentage of houseflies positive for human parasites' ova/cysts (64.5%, 129/200) was statistically higher than that of negative houseflies (35.5%, 71/200) ($\chi^2 = 8.41$, $P < 0.01$). Similarly, in Ikenne, houseflies with human parasites' ova/cysts had statistically higher percentage (88.0%, 176/200) than those negative (12.0%, 24/200) ($\chi^2 = 57.76$, $P < 0.001$).

Table 1: Abundance of houseflies in some dump sites in Ilisan and Ikenne, southwest Nigeria.

Dump sites	No. (%) of houseflies	
	Ilisan	Ikenne
A	30 (15.0)	50 (25.0)
B	50 (25.0)	65 (32.5)
C	60 (30.0)	38 (19.0)
D	60 (30.0)	47 (23.5)
Total	**200 (100)**	**200 (100)**

Table 2 shows the relative location of human parasites' ova/cysts on the BS and in the IT of the positive houseflies. Among the total positive houseflies, the percentages of occurrence of human parasites' ova/cysts on the BS in Ilisan (86.8%, 112/129) and Ikenne (86.4%, 152/176) were statistically higher that the corresponding percentage of occurrence in the IT ($\chi^2 = 54.17$, 52.99, respectively; $P < 0.001$ in both cases). In all the sampled dump sites in Ilisan, the percentages of occurrence of human parasites' ova/cysts on the BS were statistically similar ($\chi^2 = 1.90$, $P > 0.05$), but significantly different in the IT ($\chi^2 = 12.05$, $P < 0.05$). Conversely, in Ikenne, the sampled dump sites had statistically similar percentages of occurrence of human parasites' ova/cysts on the BS ($\chi^2 = 1.14$, $P > 0.05$), and in the IT ($\chi^2 = 6.86$, $P > 0.05$).

Table 2: Relative location of human parasites' ova/cysts among positive dump sites' houseflies in Ilisan and Ikenne, southwest Nigeria.

Dump sites	Ilisan			Ikenne		
	No. (%) positive*			No. (%) positive		
	Total	BS	IT	Total	BS	IT
A	22 (100)	18 (81.8)	4 (18.2)	41 (100)	35 (85.4)	6 (14.6)
B	37 (100)	29 (78.4)	8 (21.6)	59 (100)	53 (89.8)	6 (10.2)
C	45 (100)	42 (93.3)	3 (6.7)	36 (100)	28 (77.8)	8 (22.2)
D	25 (100)	23 (92.0)	2 (8.0)	40 (100)	36 (90.0)	4 (10.0)
Total	**129 (100)**	**112 (86.8)**	**17 (13.2)**	**176 (100)**	**152 (86.4)**	**24 (13.6)**

***** BS means Body surface; IT means Intestinal tract

The species of parasites carried by the positive houseflies from dump sites in Ilisan and Ikenne include *Ascaris lumbricoides*, Hookworm, and *Enterobius vermicularis* (nematodes), *Taenia* sp. and *Fasciola* sp. (platyhelminths), and *Entamoeba histolytica* (protozoan); their prevalences are shown in Table 3. In both Ilisan and Ikenne, *A. lumbricoides* (66.7%, 62.5%, respectively) had statistically highest prevalence of occurrence (χ^2 = 23.32, 47.19, respectively; P < 0.001 in both cases). On the other hand *E. vermicularis* (25.6%) and *Taenia* sp. (8.5%) had statistically highest and lowest prevalence of occurrence in Ilisan and Ikenne, respectively (χ^2 = 23.32, P < 0.001 for Ilisan; χ^2 = 47.19, P < 0.001 for Ikenne). The recorded overall percentage of occurrence of mixed parasites' ova/cysts among positive houseflies from the sampled dump sites was 28.5% (87/305). The observed mixed parasites' species are shown in Table 4. The statistically commonest case of mixed parasites' species was *Ascaris* + Hookworm + *E. histolytica* (36.8%), followed by *Ascaris* + *E. histolytica* (24.1%) (χ^2 = 49.4, P < 0.001).

Table 3: Species of parasites' ova/cysts carried by positive dump sites' houseflies in Ilisan and Ikenne, southwest Nigeria.

Species of parasites	No. (%) of houseflies positive	
	Ilisan (TP = 129)*	**Ikenne** (TP = 176)
Ascaris lumbricoides	86 (66.7)	110 (62.5)
Hookworm	52 (40.3)	71 (40.3)
Enterobius vermicularis	33 (25.6)	60 (34.1)
Taenia sp.	44 (34.1)	15 (8.5)
Fasciola sp.	65 (50.4)	49 (27.8)
Entamoeba histolytica	64 (49.6)	90 (51.1)

* TP means Total positive

Table 4: Mixed parasites' ova/cysts among positive dump sites' houseflies in Ilisan and Ikenne, southwest Nigeria.

Mixed parasites	No. (%) positive
Ascaris + *Fasciola*	12 (13.8)
Ascaris + *E. histolytica*	21 (24.1)
Ascaris + Hookworm + *E. histolytica*	32 (36.8)
Ascaris + *Taenia* + *E. vermicularis*	16 (18.4
Ascaris + *Taenia* + *E. vermicularis* + *Fasciola*	4 (4.6)
Ascaris + Hookworm + *Fasciola* + *E. histolytica* + *E. vermicularis*	2 (2.3)

DISCUSSION

The occurrence and, additionally similarity in abundance, of houseflies (*M. domestica*) in all the sampled dump sites in this study show that they are equally filthy and suffer improper management or even outright neglect. The scenario is worsened by the observation that most (76.3%) of the houseflies examined were positive for some human parasites' ova/cysts. This agrees with the report that numerous human parasites and some other pathogens are often picked by houseflies.[4,15] Some studies even revealed that *M. domestica* is the highest carrier of helminth and protozoa parasites among cyclorrhaphan flies.[16] The percentage infection of houseflies herein reported is higher than that reported by some workers.[10] The observed similarity in the percentages of houseflies positive for parasites' ova/cysts for both Ilisan and Ikenne indicates equal exposure of the dump sites' houseflies to parasite-positive human faeces. The corollary of the foregoing is somewhat widespread contamination of the dump sites with infected human in the study area. Some studies have revealed that presence of infected human faeces on dump sites is common in Nigeria.[7, 17]

In this study, parasites' ova/cysts generally occur more on the BS than in the IT agreeing with a report of gastrointestinal parasites exclusively on the external surface of houseflies.[9] This finding is of great importance because it connotes that mere perching of such houseflies on exposed fruits, vegetables, water or human foods could result in parasitic contamination. Moreover, houseflies frequently release droppings from their mouth and anus which, according to studies, could cause parasitic transmission.[18] In this study, infected houseflies were harvested from some dump sites in proximity of some food vendors. This implies that any exposed cooked food in the vicinity of the food vendors may be contaminated through the houseflies. The second author of this report has had instances of on-site observation of some food vendors in some neighbouring towns near the study area who placed their goods beside dump sites while they defaecated and/or urinated (unpublished observation). Parasitic contamination of leafy and root vegetables had been reported in the study area.[19]

Virtually all the parasites associated with dump sites' houseflies in this study had earlier been reported in houseflies[8,10,20-22] and humans.[23,24] *A lumbricoides* featured prominently with the highest prevalence in agreement with some reports on houseflies[10,11] and humans.[25,26] It is an established fact that *A. lumbricoides* is transmitted directly soil-borne, water-borne, air-borne, food-borne, through unwashed hands and fingernail-nibbling, and mechanically by houseflies and cockroaches.[27] *E. vermicularis* does not use any intermediate host[28]; houseflies may passively enhance its dispersion and eventual entry into new human hosts in the study area. The association of *E. histolytica* with houseflies herein reported corroborates an earlier record of the parasite as the most prevalent gastrointestinal parasite in all examined vegetable types in the study area.[19] Houseflies might have contributed to the transmission of *E. histolytica* in the study area.

The prevalence of hookworm in this study is relatively high (40.3%). Although hookworm ova are not infective to humans, they can be enabled to cover larger areas of endemic communities by houseflies. Hookworm had been reported in vegetables in the study area.[19] Man is the natural definitive host of *Taenia* sp., while *Fasciola* sp. is considered zoonotic being found in mature form (adult) in both herbivorous mammals (especially cattle and sheep in tropical Africa) and man.[1,27] However, both the flatworm species (*Taenia* and *Fasciola*) require appropriate intermediate hosts to complete their life cycles.[29] Their association with houseflies in the study area may not pose any direct health implication on the human inhabitants. However, their being mechanically carried by houseflies may contribute to their safe landing on suitable areas of the communities for further development.

The presence of mixed parasites' ova/cysts among positive houseflies in this study conforms to occurrence of mixed gastrointestinal infections in human populations.[24,30,31] This implies that some positive houseflies in the study area could mechanically transmit more than one gastrointestinal parasite simultaneously, especially *A. lumbricoides*, *E. histolytica* and *E. vermicularis*.

CONCLUSION

This study has shown that houseflies loaded with ova/cysts of human soil-transmitted helminths and some other human parasites are present and widespread in the study area. Measures should be taken to check the population of houseflies in the study area. In addition, there is need to embark on sustainable and proper management of dump sites, and health education of the inhabitants of the study area, including food vendors, on the role of houseflies in transmission of human gastrointestinal parasites and related pathogenic microorganisms.

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REFERENCES

1. Segun AO. Tropical Zoology. 3rd ed., Ibadan, Nigeria; University Press Ltd., 2013.
2. Chin HC, Sulaiman S, Othman HF. Evaluation of Neopace, Neopace-F101, and Malaysia Assurance Rats Glue for trapping *Musca domestica* (Diptera: Muscidae) in the field. J Trop Med Parasitol, 2008; 31: 1-5.
3. WHO. Chemical methods for the control of arthropod vectors and pests of public health importance. Geneva; World Health Organization, 1984.
4. Khamesipour F, Lankarani KB, Honarvar B, Kwenti TE. A systematic review of human pathogens carried by the housefly (*Musca domestica* L.). BMC Public Health, 2018; 18: 1049. https://doi.org/10.1186/s12889-018-5934-3.
5. Clarkson TW, Weiss B, Cox C. Public health consequences of heavy metals in dump sites. Environ Health Perspective, 1983; 48: 113-127.
6. Lakshmikantha H. Report on waste dump sites around Bangalore. Waste Management, 2006; 26(6): 640-650.
7. Agbolade OM, Oni TT, Fagunwa OE, Lawal KM, Adesemowo A. Faecal contamination of dump sites in some communities in Ijebu-North, south-western Nigeria. Nigerian J Parasitol, 2009; 30(2): 57-60.
8. Oghale OO, Ebube CA, Oluchi UO. Parasitic load on *Musca domestica* (Diptera: Muscidae) from different synanthropic environments in Umuahia

metropolis. J Public Health Epidemiol, 2013; 5(8): 309-312. Doi: 10.5897/JPHE2013.0521.
9. Balla HJ, Usman Y, Muhammad A. The role of housefly (*Musca domestica*) in mechanical transmission of intestinal parasites in Maiduguri metropolis, North Eastern Nigeria. J Natural Sci Res, 2014; 4(8): 60-65.
10. Amaechi AA, Ukaga CN, Iwunze JI, Nwachukwu MO, Anumudu B. Epidemiological implications of houseflies (*Musca domestica*) in the dissemination of diseases in Owerri, south-east Nigeria. Nigerian J Parasitol, 2017; 38(2): 298-301.
11. Deakpe TE, Manyi MM, Utume LN. Pathogenic parasites and bacteria associated with the housefly (*Musca domestica*) in Makurdi; a fly-infested area in central Nigeria. Nigerian J Parasitol, 2018; 39(1): 111-115.
12. El-Sherbini GT, Gneidy MR. Cockroaches and flies in mechanical transmission of medical important parasites in Khaldyia Village, El-Fayoum, Governorate, Egypt. J Egypt Soc Parasitol, 2012; 42(1): 165-174.
13. Gharavi MJ, Jahani MR Rokni MB. Parasitic contamination of vegetables from farms and markets in Tehran. Iranian J Public Health, 2002; 31(3-4): 83-86.
14. Sullivan JT. A color atlas of parasitology. USA; University of San Francisco, 2009.
15. Howard JJ. Nuisance flies around a landfill: pattern of abundance and distribution. Waste Management Res, 2011; 19: 308-311.
16. Umeanaeto PU, Igbokwe CC, Onyido AE, Irikannu KC, Ifeanyichukwu MO. Parasites associated with cyclorrhaphan flies caught in selected abattoirs in Awka North and Awka South Local Government Areas, Anambra State, South Eastern Nigeria. N Y Sci J, 2017; 10(8): 62-67. Doi: 10.7537/marsnys/100817.09.
17. Adeyeba OA, Akinbo JA. Pathogenic intestinal parasites and bacterial agents in solid wastes. East Afr Medical J, 2002; 79(11): 604-610.
18. Adenusi AA, Akinsanya BD, Adamu MO. Mechanical transport and dissemination of soil-transmitted helminths eggs by the common housefly, *Musca domestica*, under laboratory conditions. Nigerian J Parasitol, 2016; 37(1): 34-40.
19. Nwadike FA, Agbolade OM, Oyeyemi OT. Parasitic contamination of some fresh vegetables in a local community of Ilishan Remo, Ogun State, Nigeria. J Public Allied Health Sci, 2017; 2: 79-84.
20. Adeyeba OA, Okpala N. Intestinal parasites and bacterial pathogens carried by common filth houseflies in Ibadan, Nigeria. Afr J Medical Pharmacol Sci, 2000; 4: 53-63.
21. Pai HH, Ko YC, Chen ER. Houseflies and cockroaches as intestinal mechanical disseminators of *Entamoeba histolytica*. Acta Trop, 2003; 87: 355-359.
22. Nmorsi OPG, Ukwandu NCD, Agbozele GE. Detection of some gastrointestinal parasites from four synanthropic flies in Ekpoma, Nigeria. J Vector Borne Dis, 2006; 43(9): 136-139.
23. Jemaneh L. The epidemiology of Schistosomiasis mansoni and soil-transmitted helminthes in elementary school children from the South Gondar Zone of the Amhara National Regional State, Ethiopia. Ethiopian Medical J, 2000; 38(2): 105-118.
24. Agbolade OM, Agu NC, Adesanya OO, Odejayi AO, Adigun AA, Adesanlu EB, Ogunleye FG, Sodimu AO, Adeshina SA, Bisiriyu GO, Omotoso OI, Udia KM. Intestinal helminthiases and schistosomiasis among school children in an urban center and some rural communities in southwest Nigeria. Korean J Parasitol, 2007; 45(3): 233-238. doi: 10.3347/kjp.2007.45.3.233.
25. Greenland K, Dixon R, Khan SA, Gunawardena K, Kihara JH, Smith JL, Drake L, Makkar P, Raman S, Singh S, Kumar S. The epidemiology of Soil-transmitted helminthes in Bihar State, India. PLoS Negl Trop Dis, 2015; 9(5): e0003790. doi: 10.1371/journal.pntd. 0003790.
26. Boko PM, Ibikounle M, Onzo-Aboki A, Tougoue JJ, Sissinto Y, Batcho W, Kinde-Gazard D, Kabore A. Schistosomiasis and soil transmitted helminths distribution in Benin: A baseline prevalence survey in 30 Districts. PLoS One, 2016; 11(9): e0162798. doi:10.1371/journal.pone. 0162798.
27. Otubanjo O. Parasites of Man and Animals. Lagos, Nigeria; Concepts Publications Ltd.: 2013.
28. Heyneman D. Medical Parasitology. In: Brooks GF, Butel JS and Morse SA (eds.). Medical Microbiology, 23rd ed., Boston; McGraw Hill, 2004; 661-701.
29. Smyth JD. Animal Parasitology. Cambridge, UK; Cambridge University Press, 1996.
30. Gabrie JA, Rueda MM, Canales M, Gyorkos TW, Sanchez AL. School hygiene and deworming are key protective factors for reduced transmission of soil-transmitted helminths among schoolchildren in Honduras. Parasit Vectors, 2014; 7: 354. doi: 10.1186/1756-3305-7-354.
31. Siza JE, Kaatano GM, Chai JY, Eom KS, Rim HJ, Yong TS, Min DY, Chang SY, Ko Y, Changalucha JM. Prevalence of schistosomes and soil-transmitted helminths among schoolchildren in Lake Victoria Basin Tanzania. Korean J Parasitol, 2015; 53(5): 515-524. doi: 10.3347/kjp.2015.53.5.515.