

HOUSEFLIES (*MUSCA DOMESTICA*) AS POTENTIAL CARRIERS OF HUMAN INTESTINAL PARASITES IN JALINGO METROPOLIS

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ABSTRACT

House flies (*Musca domestica*) are nuisance pest because of their ubiquitous nature in the mechanical transmission of parasites to man. This study identifies the pathogenic parasites associated with house fly in Jalingo, Nigeria. A total of 200 flies were collected from 4 locations (Abattoir, Jalingo Main Market, Kasuwan Bera and Mile-Six Market) within Jalingo metropolis between August, 2019 and November, 2019. Three species of flies were identified during the study namely; *Musca* spp, *Sacophage* spp and *Stomoxys* spp. The house flies were analyzed for the presence pathogenic parasites using standard laboratory techniques. The results showed that the parasites *E. histolytica* 25(28.74 %), *Taenia* spp 25(28.74 %), *A. lumbricoides* 20(22.99 %), *Giardia lamblia* 8(9.20 %) and *Trichuris trichiura* 9(10.34 %) are associated with the house flies. The results showed no significant variation ($X^2=0.61$, $p>0.05$) between the parasites species. It can be concluded that house flies in Jalingo harbor pathogenic parasites on their bodies. The fact that houseflies have been incriminated to be mechanical transmitters of pathogenic diseases to man because of their anthropogenic lifestyles, measures must be taken to control fly population in order to avert both the present and future outbreak of disease conditions emanating from the flies activities.

Keywords: *Ascaris lumbricoides*, *Entamoeba histolytica*, *Giardia lamblia*, *Taenia* spp, *Trichuris trichiura*.

INTRODUCTION

The housefly, *Musca domestica*, is a common domestic fly found worldwide and lives in close proximity to humans (Paterson, 2009; Sanchez-Arroyo and Capinera, 2017). Because of their association to dirty environments caused by poor sanitary conditions by humans with faeces, garbage etc., as well as their anthropogenic activities, which allows them pick up pathogens on their body parts, they pose a serious threat to public health (Oghale *et al.*, 2013; Oyeyemi *et al.*, 2016; Onyenwe *et al.*, 2016). The ability of houseflies to mechanically transmit human intestinal parasites and pathogens have been well document (Dipeolu, 1977; Oghale *et al.*, 2013; Balla *et al.*, 2014; Oyeyemi *et al.*, 2016; Amaechi *et al.*, 2017; Deakpe *et al.*, 2018). Houseflies have also been reported as mechanical vectors of pathogenic organisms among humans and animals (Vazirianzadeh *et al.*, 2008).

House flies are strongly suspected of transmitting at least 65 diseases to humans, including typhoid fever, dysentery, cholera, poliomyelitis, yaws, anthrax, tularemia, leprosy and tuberculosis (Oghale *et al.*, 2013; Balla *et al.*, 2014; Oyeyemi *et al.*, 2016; Onyenwe *et al.*, 2016). Also, because of their indiscriminate mode of feeding, they have also been described as potential vectors of more than 100 serious pathogens which includes virus; bacteria like *Vibrio cholerae*, *Staphylococcus* and Rotavirus; fungi; enteric protozoans cyst and trophozoites like *Entamoeba histolytica*, *Cryptosporidium parvum*, *Entamoeba coli*, *Sacrocytis* spp, *Taxoplasma gondii*, *Isospora* spp, *Giardia* spp, *Trichomonas* spp, *Hymenolepis* spp, *Dipylidium* spp and *Diphyllobothrium* spp; and nematodes like helminthes eggs, *Toxocara* spp; *Ascaris lumbricoides*,

Trichuris trichiura, *Enterobius vermicularis*, *Ancylostoma caninum*, *Strongyliodes stercoralis*, Larvae of *Harbronema musca* and *Taenia* spp, which they transport on their feet and hairy legs (Dipeolu, 1977; Vazirianzadeh *et al.*, 2008; Oghale *et al.*, 2013; Balla *et al.*, 2014; Oyeyemi *et al.*, 2016; Onyenwe *et al.*, 2016).

In Nigeria, house flies have been reported to harbor parasitic pathogenic parasites and bacteria on their bodies and internal parts (Dipeolu, 1977; Oghale *et al.*, 2013; Balla *et al.*, 2014; Oyeyemi *et al.*, 2016; Amaechi *et al.*, 2017; Deakpe *et al.*, 2018).

Therefore, with the abundant multiple recorded roles of flies as potential vectors, there is dearth of knowledge on their role as mechanical transmitters of parasitic diseases in Jalingo metropolis, Taraba State. It was in the light of this that this study was undertaken to determine intestinal parasites associated with the fly in the study area.

MATERIALS AND METHODS

Study Area

This investigation was carried out in Jalingo metropolis, Taraba State Nigeria, that is located on latitude 8.8929° North and longitude 11.3771° East and it is situated at elevation 349 meters above sea level, Jalingo's climate is classified as tropical savanna. In winter, there is less rainfall in Jalingo than in summer. The climate in Jalingo is classified as Aw (winter dry season) by the Köppen-Geiger system (<https://en.climate-data.org/africa/nigeria/taraba-371/>). The average annual temperature is 27.9 °C in Jalingo. In a year, the average rainfall

is 958 mm. Precipitation is the lowest in January, with an average of 0 mm. With an average of 217 mm, the most precipitation falls in August. At an average temperature of 32.2 °C, April is the hottest month of the year. December has the lowest average temperature of the year. It is 25.9 °C. Between the driest and wettest months, the difference in precipitation is 217 mm. During the year, the average temperatures vary by 6.3 °C.

Study Sites

The study was conducted in four different sites namely; Jalingo Main Market, Jalingo Abattoir, Kasuwan Bera Market and Mile-Six Market. These sites were chosen because the products sold there, such as meat, fish etc. attract the activities of flies.

Housefly Collection

Houseflies were captured using the sweep net method over the surfaces where flies visits from Garbage dumps, vegetable stand, meat stands, "Burkutu" (Local brewed beverages) drinking places, restaurants and shops. A purposive sampling technique of 50 flies per location was adopted in the research design for ease. The houseflies were placed in well sterilized plastic containers and transported to the laboratory of Biological Sciences Department of Taraba State University Jalingo for further procession as described by Lane and Crosskey (1993).

Parasitological Analysis in the Laboratory

About 2ml of normal saline was added into each universal bottle containing the houseflies and shaken vigorously using manual technique to dislodge the parasites from the exoskeleton (body) especially hair of the houseflies. The fluid was transferred into a conical tube and centrifuged at 300rpm for about 300 sec. The tube was tilted and all supernatant fluid discarded. A drop of Lugol's iodine was added to the sediment and then re-suspended by tapping the bottom of the tube gently. A drop of the re-suspended deposit is placed on a clean free slide. A cover slip is then placed over the drop. Finally the preparation is examined under the microscope using $\times 10$ and $\times 40$ objectives. The parasites were identified by their ova or cyst (Cheesbrough, 2005; Amaechi et al., 2017).

Statistical Analysis

Data collected were entered into Excel work sheet and transported into SPSS version 19.0 for windows. Descriptive statistics using cross-tabulations of variables were employed to generate tables. Chi-square (X^2) test was used to compare occurrence of parasites among species of Houseflies within Jalingo.

RESULTS

Table 1 presents the relative abundance of flies sampled at Jalingo metropolis (Jalingo main market, Jalingo abattoir, Kasuwan Bera and mile 6 market). *Musca domestica* had the highest number of occurrence followed by *Sacophaga* spp while *Stomoxys* spp had the least number of occurrence at the Jalingo main market. Parasites identified at the main market were *E. histolytica*, *Taenia* spp, *Trichuris trichiura* and *Giardia lamblia*. *E. histolytica* had the highest number of occurrence as shown.

Table 2 shows the prevalence of parasites recovered from the study sites. According to the research carried out, Jalingo abattoir and Kasuwan Bera had the highest numbers of flies infested with parasites on their body surfaces with 16 (32%) out of the 50 flies sampled, Jalingo main market had 13 (8%) out of 50 flies infested with parasites while mile six market had 11 (6%) out of the 50 flies infested.

Figure 2 represents the parasitic load as observed in the four study sites during the research at Jalingo abattoir, Jalingo main market, Kasuwan bera and mile six market.

Table 3 presents the frequency of occurrence of parasites recovered from all four study sites. The eggs of *Entamoeba histolytica* and *Taenia* species had the highest frequency of occurrence with 25 (28.74%), followed by the eggs of *Ascaris lumbricoides* with frequency occurrence of 20 (22.99%), *Giardia lamblia* had a frequency occurrence of 8 (9.20%) and *Trichuris trichiura* had a frequency occurrence of 9 (10.34%) as seen in Table 3.

TABLE 1: Relative abundance of house flies species sampled

House fly species	Abattoir	Jalingo Main Market	Kasuwan Bera	Mile-Six Market	Total
<i>Musca</i> species	29	32	16	21	98
<i>Sacophaga</i> species	17	12	18	19	66
<i>Stomoxys</i> species	4	6	16	10	36

TABLE 2: Prevalence of parasites recovery based on study sites

Study site	No. flies sampled	No. of flies Infested	Percentage of flies infested (%)
Jalingo Abattoir	50	16	32
Jalingo Main Market	50	13	8
Kasuwan Bera	50	16	32
Mile-Six Market	50	11	6
Total	200	56	28

($X^2 = 36$; $p > 0.05$)

TABLE 3: Frequency of concurrency of parasites species recovered

Parasite Species	No. Occurrence	Percentage (%)
<i>E. histolytica</i>	25	28.74
<i>Taenia</i> spp	25	28.74
<i>A. lumbricoides</i>	20	22.99
<i>Giardia lamblia</i>	8	9.20
<i>Trichuris trichiura</i>	9	10.34
Total	87	100%

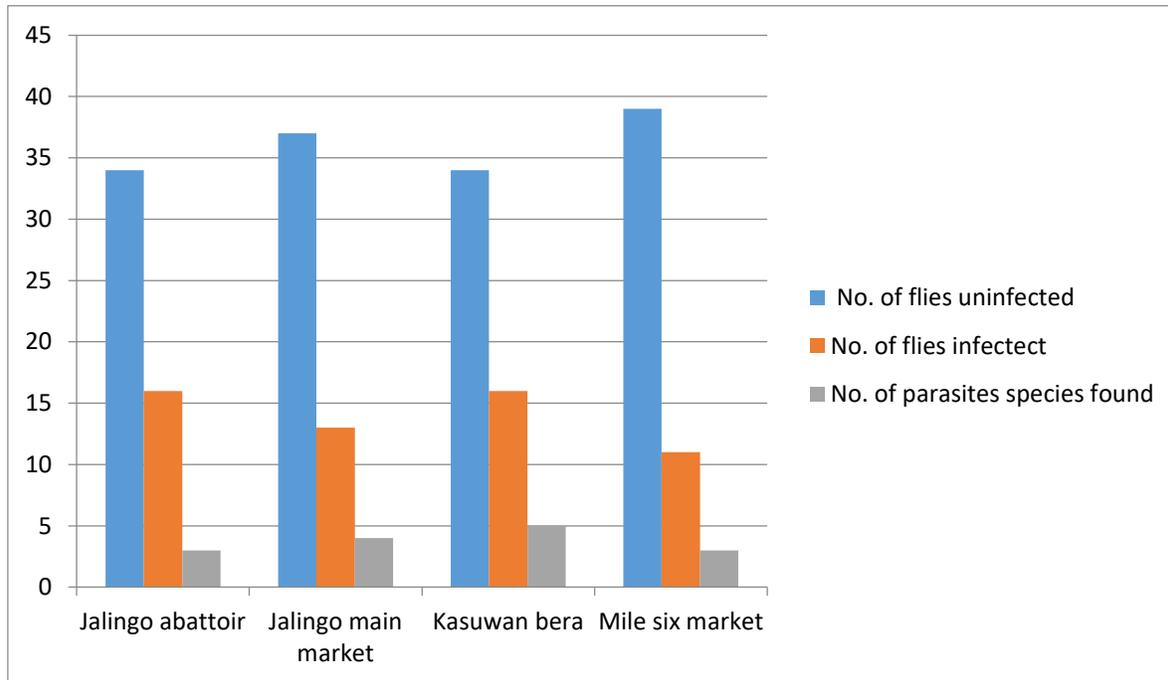


FIGURE 2: Parasite load on houseflies based on study sites

DISCUSSION

Houseflies have been conceived to transmit pathogenic organisms on their body surfaces as well as their guts. This is because they are primarily and largely associated with filthy environments (Onyenwe *et al.*, 2016; Amaechi *et al.*, 2017; Deakpe *et al.*, 2018), and favour their development (Borror, 1989). They are known to easily transmit these pathogenic organisms to humans by depositing them on human foods through their activities (Deakpe *et al.*, 2018). As a result, they can transmit varieties of pathogenic diseases such as dysentery, typhoid, cholera etc. (Onyenwe *et al.*, 2016).

In this study, it was observed that flies carry medically important parasites which include *Entamoeba histolytica*, *Taenia* species, *Ascaris lumbricoides*, *Giardia lamblia*, *Trichuris trichiura* as shown in Table 1. These species have been identified by other studies to have a wide spread occurrence in other parts of Nigeria. These parasites are mostly associated with flies and cockroaches that thrive in areas with relative food availability (Maria Alves, and Belo, 2002). Most of these vectors also patronize dirty refuse areas as it was observed in the study. We assume therefore that the parasites

adhere to their body surfaces when they leave those sites and come to feed in the open market thereby transferring their parasitic load to any surface they come in contact with.

The result of our findings revealed a high incidence of pathogenic intestinal parasites recovered from the flies in the study areas. This shows that households in the study locations are predisposed to being infected easily with these pathogenic parasites carried by the flies. This also revealed the risk level of exposure to disease carrying parasites by humans. Comparing the results from the four study sites, it was observed that the results were similar, given the fact that there was no significant difference in the number of infectious flies. Although some of the parasites were confined to certain market, for example *Trichuris trichiura* and *Giardia lamblia* were found in Jalingo main market and Kasuwan Bera. . The similarity of results as observed in the different sites can be attributed to the fact that these markets provide the same commodities and have same anthropogenic activities relating to unruly refuse disposal, commodity display and same climatic condition that promotes the occurrence of flies species and parasites. These results are in agreement with the work of Deapke *et al.* (2018), who reasoned that pathogenic parasites and bacteria associated with

housefly were undermined or promoted by sanitation practices by the surrounding environment. In a similar study conducted by Amaechi *et al.* (2017), infection was significantly higher in houseflies collected in refuse dump sites and toilets.

CONCLUSION

In conclusion housefly is found to be a potential mechanical transmitter of parasitic infection and significantly contribute to the spread of food born parasitic diseases. Some micro-organism causing bacterial and viral infection has been reported to be transmitted by housefly. Therefore, it becomes imperative to urgently institute control measures of this flies through mass education on improving environmental sanitary condition. There is a need of public awareness and education regarding the possibility of houseflies to be potential vectors of many food-borne diseases in Jalingo and the state at large. There is also a need to identify and embark on the control of housefly population in Jalingo and the entire state in order to curtail the diseases spread by the houseflies.

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