

OCCURRENCE OF INTESTINAL PARASITIC PATHOGENS ON THE BODIES OF FLIES COLLECTED FROM DIFFERENT ENVIRONMENTAL SETTINGS IN ANIOCHA SOUTH LOCAL GOVERNMENT AREA, DELTA STATE.

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Abstract

Flies are widely recognized as important mechanical vectors of parasite due to their frequent contact with human and animal wastes, decomposing organic matter, and food sources. Their ability to transport infective stages of intestinal parasites on their body surfaces presents a significant public health concern. This study investigated the occurrence of intestinal parasitic infections on the bodies of flies collected from different environmental settings in Aniocha South Local Government Area. Adult flies were collected from 4 different environmental locations (waste disposal sites, market area, food vendor area and residential area) using standardized trapping procedures. The flies were then transported to the lab for identification of vectors and isolation of parasites on the external body surfaces of the flies using concentration method. Data obtained were analyzed to determine the prevalence and distribution of intestinal parasitic pathogens across the various sampling sites. Out of the 2,817 flies collected from the study area, *Musca domestica* showed highest abundance at 1473 while *Fannia canicularis* showed the lowest abundance at 137. From the 3 selected villages in the study area, Ogwashi-Uku showed the highest abundance of flies at 1472, Azagba 737 while Isiagu was the lowest at 609. Flies collected from waste disposal area showed the highest prevalence at 54.5% while flies from residential area presented the lowest prevalence at

38.3%. food vendor areas and market areas had prevalence at 41.2% and 47.0% respectively. *Ascaris lumbricoides* showed the highest prevalence on the flies collected from residential areas 95.7%. hookworm occurred highest on flies collected from food vendor area 12.5%. *G. lamblia* occurred highest on flies from waste disposal 4.9%. *E. histolytica* also showed high prevalence on flies collected from waste disposal site at 2.2% while *T. trichuria* occurred highest on flies collected from market area at 5.9%. The findings suggest that flies serve as important links between contaminated environments and human exposure pathways through the contamination of food, water, and household surfaces. Strengthening environmental sanitation and implementing effective fly control measures are essential for reducing the risk of parasite transmission and in the study area.

Keywords: Intestinal Parasitic Infections, fly-borne transmission, mechanical vectors, environmental contamination, parasite occurrence, public health.

Introduction

Synanthropic filth flies represent nonbiting species that have evolved to thrive in areas of human and animal activities, such as food markets, restaurants, and poultry and livestock farms (Racewicz *et al.*, 2019) They are classified within families such as Muscidae (house flies), Calliphoridae (blowflies), and Sarcophagidae (flesh flies) (Adenusi and Adewoga 2013). These flies are frequently encountered in unsanitary conditions, where they breed in organic waste, refuse, and fecal material. They are associated with the mechanical transmission of parasites, fungi, bacteria, and viruses (Kassiri *et al.*, 2015). Since they interact with human food, domestic animals, and waste, they transmit various diseases (Kassiri *et al.*, 2015).

Houseflies are the most prevalent of types flies in the world, accounting for about 90% of all flies in human habitation . There are about 170 genera and 4200 species in the family Muscidae, some of them are medically important including *Musca domestica* (Oyeyemi *et al.*, 2016). House flies abound in the tropics especially in dirty environment which prefer warm places and move around mostly during the day (Ibrahim *et al.* (2018). Their frequent movements between filth places, animals, human sources of food and defecate during they feed make them best vectors for disease and spread of pathogens. Houseflies are reported as vectors for communicable diseases that collect pathogens on their body parts when females lay eggs on decomposing organic substances such as the corpses and foods, cow's and pig's feces, rubbish dumps and droppings of domesticated birds (Dar *et al.*, 2024).

Several studies showed that synanthropic flies carry different stages of helminths and protozoan parasites (Hailu *et al.*, 2020; Umeanaeto *et al.*, 2017; Nayduck *et al.*, 2023). According to Adeiyong *et al.* (2023) the eggs of *Ascaris lumbricoides*, *Trichuris*

Necator americanus and *Trichiura* isolated and from *Chrysomya*, *Sarcophaga* and *Musca* fly species collected from garbage and peridomestic sites. Houseflies carry the eggs of *Enterobius Vermicularis*, *Toxocaracanis*, *Strongyloides Stercoralis* and cysts and trophozoites of *Entamoeba coli*, as well as *Giardia* and *Trichomonas* species (Amawulu *et al.*, 2020). Most of these pathogens may live inside and on flies' external surface for 5 - 6 hours and to 35 days post-infestation (Ifedi *et al.*, 2025). Graczyk, *et al.*, (2001) observed that house flies are a major epidemiological factors responsible for spread of acute gastroenteritis and trachoma between infants and young children in developing countries and referred these flies play important role in transmission of nosocomial infections with multi drug resistance bacteria in hospital environments.

Despite the potential public health implications, there is limited information on the occurrence and distribution of intestinal parasitic pathogens on the bodies of flies from different environmental settings within the area. The lack of local data on the types and prevalence of intestinal parasitic pathogens carried by flies makes it difficult to assess the extent of the public health risk and to develop effective control measures. Specific report on the occurrence of flies as a mechanical vector of intestinal parasites generally in Aniocha South Local Government Area, Delta State has not been established. This study to determine the extent of parasitic contamination among fly populations and to evaluate variations in pathogen occurrence across selected environmental locations.

Materials and Methods

Study Area:

The research was carried out at Aniocha South Local Government Area. Aniocha South Local Government Area consist of Enuani Igbo speaking Communities in Delta State, Nigeria, Located west of the state capital Asaba at latitude 6°08'N and longitude 6°29'E. The Local Government headquarters is located in Ogwashi-Uku town. The Communities under this Local Government includes Adonte, Aba Unor, Umute, Umudike, Uku-Oba, Ogwashi-Uku, Ubulu-Unor, Ubulu-Uku, Ubulu-Okiti, Otulu, Nsukwa, Nkpulu, Isheagu, Azagba, Ejeme-Unor, Ejeme-Aniogor, Ashama, Egbudu-Akah and Ewulu. The study area is bordered by Aniocha North, Oshimili South, Ndokwa West, and Ika North East Local Government. According to 2015 population data, the population of Aniocha South Local Government Area is about 191,019, however, its number has increased vastly and keeps increasing. Aniocha South Local Government Area (LGA) is primarily located within the Lowland Rainforest ecological zone.

Collection of Flies

Two Thousand Eight Hundred and Seventeen (2817) flies were caught with a fine sweep net from four (4) different sites in the communities. The flies were collected daily between 9 am and 12 pm, from the month of May to June 2025. The collected houseflies were killed in normal-sized jam bottles containing 10% cotton-soaked formalin, labeled with the container, and transported to the Department of Biological Science, Chukwuemeka Odumegwu Ojukwu University, Uli Campus for identification by an entomologist. The identification was done using a hand lens to reveal in details some physical characteristics like segmented bodies (head, thorax, abdomen), wing venation, leg structure, mouth part, Colour and antenna shape.

Sample processing

Parasite isolation: In the laboratory, each of the identified fly species was transferred to a separate surface using a sterile forceps and was further cut into different body parts; the head, wings, appendages and the body (the thorax and abdomen). These separated body parts were put separately into a labeled vial containing normal saline, capped and allowed to stand for 10 minutes before they were washed thoroughly by rocking gently for 2 minutes to create a suspension whereby organisms attached externally to the bodies of the flies got dislodged. Each body part was removed using the sterile forceps and the suspensions were centrifuged at 300 revolutions per minute (rpm) for 3 minutes. The supernatant was decanted while the sediments were placed on a clean glass slide, covered with cover slips and was examined microscopically under x10 and x40 objective lenses. The parasites harbored externally by the flies were then identified (Cheesbrough, 2006). During this process, about 2-3 drops of Lugol's iodine solution were placed on the slide for proper identification of helminths eggs.

Data Analysis:

Data from the study were analyzed using descriptive statistics and Chi square (χ^2) tests were applied to determine associations between sampling sites and parasite recovery, as well as between parasite species and recovery location (external or internal). Results were interpreted at a 95% confidence level, and p-values less than 0.05 were considered statistically significant.

The specific objectives of this research are:

- To determine the abundance of house flies and cockroaches in the selected towns.
- To Assess the abundance of Intestinal Parasitic Infections on the bodies of the house flies in the study area.

The overall prevalence of intestinal parasitic infection among 600 participants from Ogwashi-Uku, Isiagu and Asagba in Aniocha South Local Government Area of Delta State is 41.2% with *Ascaris lumbricoides* having the highest prevalence at 40.1%. The prevalence was highest in Isiagu at 38.1% and lowest in Ogwashi-Uku at 29.9% which is a sub-urban area of the local

government. There was no significant difference with location and number of flies captured in Ogwashi-Uku but there was a significant difference in method of capture Ogwashi-Uku, Azagba and Isiagu. There was significant difference with location and number of flies captured in Azagba and Isiagu. Cockroaches showed the highest abundance in Ogwashi-Uku and Isiagu but Residential areas showed the highest abundance in Azagaba. Out of 2817 flies examined, 1304 were infected with overall prevalence of 46.3% while 985 cockroaches examined and 336 were infected with overall prevalence of 34.1%. This Chapter also showed other sanitation and hygiene practices and their effect on the prevalence of intestinal parasitic infection.

Results

Table 1: Abundance of fly species in Isiagu, Ogwashi-Uku and Azagba towns

Species	Isiagu (%)	Ogwashi-Uku (%)	Azagba (%)	Total (%)
<i>Musca domestica</i>	320	743	410	1,473
<i>Musca sorbens</i>	90	276	110	476
<i>Chrysomya megacephala</i>	65	207	72	344
<i>Lucilia cuprina</i>	56	89	55	200
<i>Sarcophaga haemorrhoidalis</i>	44	85	59	188
<i>Fannia canicularis</i>	34	72	31	137
Total flies	609	1,472	737	2,818

$$X^2 = 29.26, df = 10, p\text{-value} = 0.0011$$

1. Prevalence of flies in the study area

Fly species	Study site	No. Examined	No. Infected	Prevalence (%)
<i>Musca domestica</i>	Waste Disposal	350	210	60.0
	Food Vendors	230	96	41.7
	Market Areas	330	165	50.0
	Residential Area	260	104	40.0
<i>Musca sorbens</i>	Waste Disposal	150	78	52.0
	Food Vendors	120	46	38.3
	Market Areas	150	68	45.3
	Residential Areas	120	44	36.7

<i>Chrysomya megacephala</i>	Waste Disposal	120	64	53.3
	Food Vendors	80	36	45.0
	Market Areas	130	64	49.2
	Residential Areas	90	38	42.2
<i>Lucilia cuprina</i>	Waste Disposal	90	44	48.9
	Food Vendors	60	24	40.0
	Market Areas	90	42	46.7
	Residential Areas	70	28	40.0
<i>Sarcophaga haemorrhoidalis</i>	Waste Disposal	76	42	55.3
	Food Vendors	36	16	44.4
	Market Areas	84	38	45.2
	Residential Areas	50	18	36.0
<i>Fannia canicularis</i>	Waste Disposal	50	18	36.0
	Food Vendors	18	06	33.3
	Market Areas	40	10	25.0
	Residential Areas	23	03	13.0
TOTAL	Waste Disposal	836	456	54.5
	Food Vendors	544	224	41.2
	Market Areas	824	387	47.0
	Residential Areas	613	235	38.3

$X^2 = 44.39$, $df = 3$, p value = 0.001

Table 3: Prevalence of intestinal parasitic infection on the bodies of the flies

Fly species	Study site	A. <i>Lumbricoides</i> (%)	Hookworm(%)	G. <i>lamblia</i> (%)	E. <i>Histolytica</i> (%)	T. <i>Trichuria</i> (%)
<i>Musca domestica</i>	Waste Disposal	208 (99)	02 (1)	0.00	0.00	0.00
	Food Vendors	80 (83.3)	0.00	16(16.7)	0.00	0.00
	Market Areas	165 (100)	0.00	0.00	0.00	0.00
	Residential Areas	104 (100)	0.00	0.00	0.00	0.00
<i>Musca sorbens</i>	Waste Disposal	50 (64.1)	08 (10.3)	10(12.8)	10(12.8)	0.00
	Food Vendors	30 (65.2)	0.00	12(26.10)	04 (8.7)	0.00
	Market Areas	55 (80.9)	0.00	10 (14.7)	03 (4.4)	0.00
	Residential Areas	44 (100)	0.00	0.00	0.00	0.00

<i>Chrysomya megacephala</i>	Waste Disposal	64 (100)	0.00	0.00	0.00	0.00
	Food Vendors	36 (100)	0.00	0.00	0.00	0.00
	Market Areas	30 (46.9)	12 (18.8)	9 (14.1)	0.00	13 (20.3)
	Residential Areas	28 (73.7)	10 (26.3)	0.00	0.00	0.00
<i>Lucillia cuprina</i>	Waste Disposal	44 (100)	0.00	0.00	0.00	0.00
	Food Vendors	24 (100)	0.00	0.00	0.00	0.00
	Market Areas	42 (100)	0.00	0.00	0.00	0.00
	Residential Areas	28 (100)	0.00	0.00	0.00	0.00
<i>Sarcophaga haemorrhoidalis</i>	Waste Disposal	42 (100)	0.00	0.00	0.00	0.00
	Food Vendors	16 (100)	0.00	0.00	0.00	0.00
	Market Areas	38 (100)	0.00	0.00	0.00	0.00
	Residential Areas	18 (100)	0.00	0.00	0.00	0.00
<i>Fannia canicularis</i>	Waste Disposal	18 (100)	0.00	0.00	0.00	0.00
	Food Vendors	06 (100)	0.00	0.00	0.00	0.00
	Market Areas	10 (100)	0.00	0.00	0.00	0.00
	Residential areas	03 (100)	0.00	0.00	0.00	0.00
TOTAL	Waste Disposal	426 (93.4)	10 (2.2)	10 (2.2)	10 (2.2)	0.00
	Food Vendors	192 (85.7)	28 (12.5)	4 (1.8)	0.00	0.00
	Market Areas	330 (85.3)	12 (3.1)	19 (4.9)	3 (0.8)	23 (5.9)
	Residential Areas	225 (95.7)	10 (4.3)	0.00	0.00	0.00

$\chi^2 = 44.39$, $df = 3$, p value = 0.001

Discussion

Table 1 presented six species of flies found in the study location, with Ogwashi-Uku recording the highest abundance of flies at 1472 and isiagu recorded the lowest abundance at 609. *Musca domestica* (1473) were the most dominant species across all locations while *Fannia canicularis* was the lowest occurring species at 137. High insect abundance, particularly in Ogwashi-Uku, suggests favourable breeding conditions due to poor waste management and organic matter accumulation given that the village has more economic activities and foot traffic than the others. Similar observations were made by Oghale *et al.*, 2013, Omudu and Amuta (2007) and Patel *et al.*, (2022), who identified

markets and refuse dumps as major insect breeding sites. This result is higher than the 16.7% prevalence reported by Amawulu *et al.*, (2020) in Amassoma community of Bayelsa state as well as the 2.9% reported in central Sudan by Ibrahim *et al.* (2018). The result is also consistent with reports by Singh *et al.*, (2023), who found that flies are more mobile and frequently contact fecal matter, thereby serving as more efficient mechanical vectors. This can be as a result of the different levels of sanitation in those areas.

Table 2 presents the prevalence of flies collected from various environmental site in the study area. Waste disposal sites and market areas recorded the highest parasite carriage, with an overall prevalence of 54.5% and 47.0%, respectively. Residential compounds had the lowest prevalence (38.3%). These findings confirm the role of flies as mechanical vectors of intestinal parasites, capable of transmitting helminth eggs and protozoan cysts from contaminated waste to food and household surfaces. This agrees with studies by Graczyk *et al.*, (2005), Patel *et al.*, (2022) and Oghale *et al.*, (2013)

The result presented in table 3 reveled intestinal parasitic infections found on the bodies of different fly species across four different sites (waste disposal, food vendors, market areas, residential compounds), with the highest occurring infection to be *Ascaris lumbricoides* around residential compounds (95.7%), waste disposal (93.4%), food vendor area (85.7%) and market areas (85.3%) and the lowest occurring parasite is *T. trichuria* recording only 5.9% in Market area. There was no significant difference in the occurrence of other species on the bodies of the flies examined. This finding is in agreement with the finding in the study carried out by Ifedi *et al.*, 2025 where the occurrence of intestinal parasites on the external surfaces of synanthropic flies were isolated from flies collected in Anambra State. On the whole, the highest number of intestinal parasites isolated was *A. lumbricoides* 85(25.9%), followed by *Entamoeba* sp. 76(23.2%). The least number of intestinal parasites isolated was *T. trichiura* 22(6.7%). *M. domestica* harbored the highest number of intestinal parasites 112(34.1%), followed by *Chrysomya* sp. 96(29.3%). And the least number was recorded in *Muscinastabulans* 23(7.0%). This result is also in line with the findings in the result carried out by (Balla *et al.*, 2014 and Nwangwu *et al.*, 2013, Ike *et al.*, 2024). This High prevalence around waste disposal, residential area, market and food vending points can be attributed to poor sanitation and open waste as observed in the study area. The high abundance of flies around these areas underscores the role of poor waste management in promoting vector proliferation. Similar observations were made by Yusuf *et al.*, (2021), who reported that open refuse dumps serve as major breeding grounds for houseflies, facilitating the mechanical transmission of intestinal parasites.

Conclusion

This study demonstrated that flies collected in Aniocha South Local Government Area of Delta State serve as important mechanical vectors of intestinal parasitic Infection. The presence of these pathogens on the bodies of flies across the sampled locations highlights the role of environmental sanitation, waste management practices, and human activities in facilitating pathogen dissemination. The findings reinforce the need for integrated environmental and vector control strategies. Overall, the study provides evidence that fly-mediated contamination remains a potential public health threat in the study area and may contribute to the persistence of intestinal parasitic infections within the Aniocha South Local Government Area of Delta State

Contribution to Knowledge

This study contributes to existing knowledge by providing empirical evidence on the occurrence and distribution of intestinal parasitic infection on the bodies of flies from different environmental settings within the study area, Unlike many previous studies that focused primarily on human infection rates in the study area.

Recommendations

1. Local health authorities should strengthen environmental sanitation programmes, particularly in markets, refuse disposal sites, abattoirs, and other locations that attract large fly populations and employ safe fly control measures.
2. Community-based health education awareness should be implemented to increase awareness of the role of flies in the transmission of intestinal parasitic infections and to promote proper hygiene practices.
3. Improved waste management systems, including regular refuse collection and proper disposal of organic waste, should be prioritized to reduce breeding sites for flies.
4. Food vendors and household food handlers should be encouraged to adopt effective food protection measures, including covering food items and maintaining clean preparation environments.
5. Subsequently, studies should employ molecular diagnostic techniques to improve parasite detection and characterization, while also investigating seasonal patterns, internal fly carriage, and the relationship between environmental contamination and human infection rates in the study area.
6. Inclusion of vector surveillance to environmental health monitoring to facilitate early detection and control of potential sources of intestinal parasitic infection transmission.

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