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Full length research paper

Prevalence of human Myiasis infestation among primary school pupils in Ayamelum Local Government Area, Anambra State South- Eastern Nigeria

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Infestation of live human or other vertebrate host with true fly larvae belonging to the class Hexapod, order Dipterans is called Myiasis. A prospective prevalence study of human myiasis among primary school pupils in Ayamelum Local Government Area (LGA) of Anambra State was carried out from October 2015 to September 2016. The mean age of the subject was 7.3±1.9. Of the 3,250 pupils who participated in the study from eight towns that constitute the LGA 287 (8.8%) pupils were positive to myiasis. *Cordylobia anthropophaga* (tumbu fly) was found to be the predominating fly species involved in the myiasis infestation implicated in furuncular myiasis with 92.6% of the pupils. Other species such as *Cochliomyia hominivorax /Phaenicia sericata* (blow fly) and *Musca domestica* (house fly) were also found infesting the wounds with 3.3% and 4.1% pupils respectively. The prevalence pattern also varies considerably in 8 towns that constituted the LGA with location 2 with highest: 6.1% locations 5&7 lowest with 3.2% and 1.9% respectively. Age showed significant association with pupils ≤6years most susceptible p <0.01. The highest infestation rate was recorded between April to July usually the rainy season. The most frequently infested body regions were the scalp of the head, buttocks and thigh. Ignorance, filthy environment, unkempt little children, and dirty hygienic practices are major predisposing factors of myiasis infestation among primary school pupils in the area under study.

Keywords: Prevalence, Myiasis, Dipterans Larva, primary school pupil.

Introduction

Myiasis refers to infestation of dermal or sub-dermal and sometimes nasopharyngeal, intestinal and urinogenital regions of the body by developing larvae (maggots) of a Varity of fly species in the phylum Arthropod order Dipterans (Myia in Greek = Fly) Blechman and Alcock 2016. Globally, the most common flies that cause the human infestation are *Dermatobia huminis* (human botfly) and *Cordylobia anthropophaga* (tumbufly), cutaneous myiasis have two main clinical types which include wound myiasis and furuncluar (follicular) (Bolognia et al., 2008).

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Myiasis, cavitary, creeping of migratory myiasis infect body organs, nasopharyngeal myiasis involved the nose, sinuses, and pharynx and ophthalmic myiasis affects the eyes, orbits, and periorbital tissue while intestinal and urinogenital myiasis involves invasion of the alimentary tract or urogenital system (Burns et al., 2004; Diaz (2006).

Hematophagous myiasis is a rare type of myiasis which affects infants that are younger than 9 month (Auerbach 2007). *Dermatobia hominis* (human botfly) that causes furuncular myiasis is endemic to tropical Southeast Mexico, South America, Central America, and Trinidad and Tobago. The adult fly look-like a bumble bee lives or survives between 7-10 days does not feed and rarely seen. The botfly has a unique life cycle, as the female,

egg-bearing fly catches a blood-sucking tick and attaches her eggs to its to its abdomen (means of transportation known as phoreses); as mosquito takes blood meal from a warm-blooded animal, the local heat induces the egg to hatch and drop to the skin of the host and enter painlessly through the bit of the carrier or some other small trauma (Blechman and Alcock 2016). The larval develops as small and fusiform and later becomes pyriform to ovoid, and fully develop larval measures between 15-20mm in lengths, encircled by server as rings of spines, if not disturbed, a fully-developed larvae emerges from the host in 5-10weeks (Davis et al., 2009). *Cordylobia anthropophaga* (tumbfly) furuncular myiasis is endemic to sub-Saharan Africa, the adult fly is about the size of a housefly but stockier. The Dipterans prefers shade and is most active in the early stage is most active in the early morning and afternoon, attracted by the odor of urine and feces. The females lay their eggs on dry, sandy soil or on damp clothing.

Out to dry (Maier and Honigsmann 2004; Quintanilla-Cedillo et al., 2005), the eggs hatch in 1-3 days and can involve near the soil surface or on clothes for up to 15 days waiting for contact with a suitable host, and activated by heat i.e. the body heat of the potential host, the larvae are capable of penetrating the unbroken skin with sharp mandible, inside the skin become fusiform to ovoid and reach a length of 13-15mm with short larval stage than the human botfly and completed in 9-14 days(Davis et al., 2009).

Cochliomyia hominivorax/Phaenicia sericata (blowfly) causes wound myiasis. The adult flies are stocky flies and metallic blue-green to purplish black in colour. The larvae are pinkish-fusiform and segmented female flies deposit the eggs near poorly managed wounds and the larvae feed on necrotic tissue (Jame et al., 2011). Infestation is often acquired while resting outside the day or may result from wound or injury (Mandell et al 2000). *Hypoderm bovis/Gastrophlus intestinalis* causes creeping/migratory myiasis. The adult fly of the *Hypoderma/Gastrophilus* genus is large and hairy and resembles a bumblebee. The definitive hosts for the larvae of this fly are deer, cattle, and horse. The larvae of the *Gastrophilus* genus are usually gastrointestinal (*Gastrophilus intestinalis)* or nasal *(Gastrophilus nasalis)* parasite of horses in humans, the young larvae burrow in the skin and wander intradermally, creating narrow, tortuous, erythematous and linear lesions with intense pruritus which advanced 1-30 could and the death of the larvae terminates in 1-2 weeks without sequelae (Sharma et al., 2011; Aydin *et al.,* 2006).

Myiasis is a worldwide infestation with seasonal variation, the prevalence is related to the latitude and lifecycle of the various species of flies, with highest in the tropics and subtropics of Africa, Asia and America (Burns et al 2004). *Dermatobia hominis* also known as human or tropical botfly is endemic to tropical Mexico, South America, Central America and Trinidad Mandell et al 2000;Masoodi and Hosseini 2004),while *Cordylobia anthropophaga* (tumubufly) is endemic to Sub-Saharan Africa (Garvin and Singh 2007). In urban and sub-urban study conducted in United States found an association of homelessness, alcoholism and peripheral vascular disease with cutaneous myiasis; the most common fly identified in the study was *Phaenicia sericata* green blowfly (Schwartz & Gur 2002). Myiasis is not prevalent in any particular race, sex, and may occur at any age but most common among children of school age. The larvae *Conchliomyia hominivorax* which causes wound myiasis can infest around orifices of the head and may burrow into brain tissue (Terterov et al., 2010; Clyti et al., 2007).

Anambra state in South Eastern geopolitical zone of Nigeria and some part of the world, human play an important role as reservoir for the development of some Dipteran flies. However, despite the public health significance of human myiasis, scarcity of publish articles and research of its age prevalence based on location (environment) and seasonality in south Eastern Nigeria still prevail. This prevalence study was carried out to determine the environment and seasonality prevalence of human myiasis over one year period (2015-2016) in Ayamelum LGA of Anambra state among primary school pupils in Nigeria.

Material and method

This study was conducted at different areas i.e. towns in Ayamelum Local Government Area of Anambra South, eastern Nigeria among pupils of primary schools in eight towns which include, Anaku, Omor, Omasi, Umumbo, Ifite Ogwari, Umuerum, Igbakwu and Umueje Ayamelum has its capital at Anaku ; bounded in the west with Anambra West LGA in the South with Anambra East LGA and Awka North LGA both in Anambra and bounded in the north with Uzouwani LGA of Enugu state and in the east with Ezeagu LGA of Enugu state. The major occupation of the people of Ayamelum is farming involving crops cultivation and animal husbandry. The staple foods are rice maize and other root crops supplemented by cattle and livestock rearing. The public primary schools distribution base on each town is as follows. Anaku 3 primary schools; Omor 12 primary school; Omasi 4 primary school; Umumbo 7 primary schools; Ifite Ogwari 10 primary school; Umuerum 4 primary schools; Igbakwu 4 primary school, Umueje 3 primary schools totaling 47 primary schools in the LGA. Towns with more than 3 primary schools were subjected to sampling and twenty-four primary schools were selected with total population of 9,870 pupils. Three thousand, two hundred and fifty pupils enrolled after informed consent was obtained by the pupils through the school authority to enroll. A closed ended questionnaire with categorical question was designed. Observation of

the pupils and records were taken. Data were recorded from infected pupils included age, sex, body condition (i.e. temperature) onset and duration of illness, affected sites of myiasis, frequencies of larvae and associated risk factors from October 2015 to September 2016 other information in the questionnaire include deform (boils), environment housing pattern, floor (Thatch/dirty/mind/brick/concrete etc) Depending on the site of infestation larvae were manually extracted from skin and subcutaneous skin with forceps or by applying digital pressure after applying petroleum jelly or palm oil, wax or paraffin to reduce oxygen supply to larvae so that it comes out for want of air. The larvae were collected in glass bottle containing 70% ethanol for their preservation. These maggots were examined under the microscope based on some features in the body such as anterior spiracles, posteriori spiracles and cephalo pharyngeal skeleton. Identification was done by following the keys available in literature (Zumpt 1965).Data were analyzed using SPSS for window version 12.0.1. Variables that showed significant association were further analyzed using Chi-square and the strength of association was interpreted using the adjusted odds ratio and confidence interval.

Results

Out of the 3,250 pupils enrolled in the one year or 12 month study, 287 (8.8%) were positive for human myiasis. An evaluation of the monthly positive cases shows that there was appreciable increase in April 8.1% and peaked in July 21.3% and the least prevalence recorded in January 3.7%.The number of positive cases of myiasis that occurred with the rainy season April through October excluding, August during which pupils were on holiday was 211 which is (73.5%) Table 1. Over 2/3 of the positive cases, prevalence on location showed that location “A” which represents a town was highest 42% with least prevalence recorded by “H” 1.0% although the prevalence level seems to vary between 1.2%-1.0percent indicating little or no disrupting in the pattern of prevalence. Age was another variable that was highly significantly. Pupil $5-6$ years of age presented much more positive costs than pupils above 6 years of Age P value 0.001. On the association of positive cases with gender, female gender recorded higher positive cases than their male counterpart 58.8% case against 41.5%. Table 2

Discussion

This study has shown that human myiasis occurs in Ayamelum LGA of Anambra state among pupils throughout the months in year exclusively August with the prevalence of (8.8%). Myiasis is associated with lying on dam soil, wearing damp clothing contaminated with excrements and un-ironed clothing. The result reveals high prevalence in the month of May, June and July in the following order 10.2%, 15.9% and 2.3 which is usually the period of wet or raining season in Nigeria. This result is consistent with the observation of most studies conducted in different parts of the world (Delenasaw et al., 2007). This finding also was in consonant with the research (Ogbalu et al., 2011).

The study implicated two types of Dipterans larvae of *Cordylobia anthorpophaga* and *Dermertobia hominis.* The larvae of *C. anthropophaga* infestation among the pupils were highest. Although in their own study conducted in south-south and south-east, Ogbalu et al., recovers both *C. anthropophaga, Lucilia s*pp. maggots among the neonates and children. Based on age infestation record among children aged 5-6years recorded highest infestation of maggots 53.4% P-value 0.01 most of the pupils in this age bracket were found either with infection or with a scar of mylasis in one part of their body or the other(Ogbalu et al., 2011).

On environmental and the building of the subject children that habitate a thatched houses with sand and mud floors recorded higher prevalence than those who lived in a concrete and cemented floor with dry clean environment. Most of the studies carried out in Africa generally observed that damp or wet floor littered with urine and fowl odor attracts gravid female Dipterans flies, which deposits its eggs on such environment and on contact with the temperature of the skin develop immediately to a maggot which bore and penetrates the subcutaneous region of the host and began to develop (Delenasaw et al 2007; Ogbalu et al., 2011).

Sites of infection showed that four major sites ‘the scalp of the head, buttocks, thigh and other extremities such as the back, penile and vulva regions of the body. The region mostly affected in this study is the head, buttocks and the thigh and other extremities recorded low incidence, probably because of its delicate nature and sensitivity in reacting to infestation. Usually the group of the study suggests that recorded infestation in that region were pupils of 5-6years of age. Similar observation was made by other researchers. A study in India (Bapat 2000; Cetinkaya et al., 2008) reported differently on a twelve days old female neonates infected with *Lucilia spp* and also another report was given on maggot infestation in wounds of injured soldiers(McGraw and Turriansky 2008). And (Ogbalu et al., 2011), also reported in their study that the buttocks of neonates’ toddlers and children sustain higher number of maggots and this is common among female children, who were always in contact with their puppy. Sometimes in rural areas little children especially the female one wears wet panties due to poverty.

Table I: Prevalence rate of human myiasis among primary schools pupils in Ayamelum LGA of Anambra state

Months	Number of pupils examine for myiasis infestation	A	B	C	D	E	F	G	H	Total number positive	Mean positive number	% prevalence
October	295	3	3	2	2	3	3	2	2	20	2.5	6.8
November	296	2	3	2	2	2	2	2	2	17	2.1	5.7
December	296	2	2	2	2	2	2	2	2	16	2.0	5.4
January	296	1	1	1	1	1	2	2	2	11	1.4	3.7
February	295	2	2	1	1	2	2	2	2	14	1.8	4.8
March	296	3	3	2	2	2	2	2	2	18	2.3	6.1
April	295	3	3	4	3	3	4	3	3	26	3.3	8.1
May	294	4	4	4	4	4	4	3	3	30	3.8	10.2
June	295	8	5	6	6	6	5	6	5	47	4.6	15.9
July	296	9	8	7	7	8	8	8	7	63	5.0	21.3
September	296	3	3	4	2	3	3	3	3	25	3.1	8.5
Total	3250	70	37	35	35	36	37	35	33	287		8.8

A=Anaku, B=Omor, C=Omasi, D=Umumbo, E=Ifite Ogwari, F=Umuerum, G=Igbakwu; H=Umueje.

Table 2: Distribution between different variables with the frequency of larva causing human myiasis in primary school pupils examined using chi-square (X^2)-test variables items

Location	Frequency of larvae in positive cases ≤ 3 larva and %	4-6 Larvae and %	>7 Larvae and %	Total (N) of positive cases and %	P-value
A	15(40.0)	17(42.5)	7(17.5)	40(13.9)	
B	15(40.5)	17(45.9)	5(15.5)	37(12.9)	
C	14(40.0)	16(45.7)	5(14.3)	35 (12.1)	
D	14(40.0)	17(48.6)	4(11.4)	35(12.1)	
E	12(33.3)	18(50.0)	6(16.7)	36(12.5)	0.46
F	14(37.8)	19(54.4)	4(10.8)	37(12.9)	
G	15(42.9)	14(40.0)	4(17.1)	35(12.1)	
H	13(39.4)	14(42.4)	6(18.2)	33(11.5)	
Age					
5 – 6years	60(33.0)	82(45.0)	40(22.0)	182(63.4)	0.01
>6 years	35(33.3)	55(52.4)	15(14.3)	105(37.6)	
Sex;					
Female	58(34.5)	72(42.9)	38(22.6)	168(58.5)	0.35
Male	41(34.5)	56(42.9)	22(18.5)	119(41.5)	
Season					
Dry	12(26.7)	28(62.2)	5(11.1)	45(15.7)	
Harmathan	10(32.3)	13(41.9)	8(25.8)	31(10.3)	0.01
Rainy	49(31.0)	99(50.0)	33(19.0)	211(73.5)	
Temperature					
Fever	38(20.3)	89(47.6)	60(32.1)	187(65.2)	0.01

Table 2 Cont

Normal	**28(28.0)**	**58(58.0)**	**14(14.0)**	**100(34.8)**
Environment/Housing pattern Thatch/ Dirty	46(34.3)	58(43.3)	30(22.4)	134(46.7)
Mud/Brick	36(35.3)	42(41.2)	24(23.5)	102(35.5)
Concrete floor	18(34.6)	26(50.1)	7(13.5)	52(18.1)
Location of interaction Head/Neck	30(33)	48(52.8)	18(19.8)	91(31.7)
Buttocks	28(31.1)	46(51.1)	16(17.8)	90(34.3)
Thigh	20(26.3)	42(52.3)	14(18.4)	76(26.5)
Others(i.e. back, extremites, penial,vul)	10(33.3)	12(40.0)	8(26.7)	30(10.5)

Conclusion

Our findings in the current study is to expose the existence of this common but very important public health concern disease carried by inevitable insects in all communities of nearly the whole world in rural and semi urban communities. And to create awareness of the case and to ensure that adequate measures of prevention and proactive measures are taken to prevent the infection, ironing of cloth in endemic area, are strongly advocated. Parents should rear their children in dry clean floor; wash and spread clothes wetted with urine by child in hot sun or hot dried environment; prevent their younger children from wearing wet panties and ensure their hair is always shaved or keep them very clean and dried.

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