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KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS SANDFLY AND CUTANEOUS LEISHMANIASIS AND PRESENCE OF SANDFLY IN IKEDURU L.G.A. IMO STATE, NIGERIA

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Introduction

Phlebotomine sandflies are insects belonging to the order *Diptera* and the family *Psychodidae*. About 800 species of sand flies have been identified which are placed in five genera viz: *Brumptomyia*, *Lutzomyia*, *Phlebotomus*, *Sergentomyia* (Kettle, 1993; Wall and Shearer, 2001). Although the majority of sandfly species play no part in the transmission of leishmaniasis in nature, about 10% of sandfly species have been incriminated as vectors of leishmaniasis in different parts of the world (Killick-Kendrick, 1999; Bates, 2007; Kato et al., 2010). Among the many genera of *Psychodidae*, only species of *Phlebotomus* and *Lutzomyia* are currently proven or suspected vectors of human leishmaniasis although, few studies have recently suggested the possible involvement of some species of the genus *Sergentomyia* in the transmission of Leishmaniasis in the Old World, (Senghor et al., 2011).

Leishmaniasis is a group of neglected tropical diseases caused by a protozoan of the genus *Leishmania* (Zorrilla et al., 2017). Leishmania parasites cause a wide spectrum of clinical manifestations that are divided into cutaneous, mucosal (ML), and visceral leishmaniasis (VL). Cutaneous leishmaniasis manifests as skin lesions in humans and may affect the mucous membrane. The lesion begins as a tiny, reddish and often itchy papule that gradually enlarges, bursts into an ulcer, the edges of the ulcer become raised and firm with the surrounding skin a dusky red color. Generally, cutaneous lesions resolve spontaneously after two months to two years, leaving a disfiguring, mottled, depressed scar, with altered pigment, and which persists throughout life.

As indicated by the WHO, 2018, leishmaniasis remains among the top emergent infectious diseases on the planet, despite control measures. The number of cases is increasing primarily in developing countries as a result of human encroachment into the habitats of animal reservoirs, poor housing, and consequent exposure to infected vectors. Indeed, it is considered second just only to malaria as a major cause of parasite burden. A typical gauge of the overall yearly frequency is 600,000 recently revealed clinical cases, an overall prevalence of 12 million cases, and an expected populace in danger of around 350 million in 88 nations (FMOH, 2012).

There are documented researches on the composition of Phlebotomine sandflies and different forms of leishmaniasis in parts of Africa. However, this information is inadequate in profiling the status of the disease and its vector. Despite their indisputable importance in human medicine, inadequate and inconsistent attention has been paid to sandfly species and cutaneous leishmaniasis in Nigeria. This is unfortunate because of the existence of a favorable epidemiological environment for the occurrence of sandfly and cutaneous leishmaniasis.The few reports available on sandflies are from the Northern part of the country which includes Asimeng (1990), Agwale et al. (1995) which identified among the many genera of Psychodidae, only species of *Phlebotomus* and *Lutzomyia* as vectors of human leishmaniasis.

In the African continent, CL is caused by *L. major*, *L. tropica*, and *L. aethiopica* and is unevenly distributed from the northern to the southern areas of the continent and it is the common form of leishmaniasis in Nigeria (FMOH,2012). The reports on cutaneous leishmaniasis are limited to Northern Nigeria (Obasi, 1991, Asimeng, 1985, Asimeng, 1990, Awosan et al., 2013, Adamu et al. 2012). The forested Southeastern parts of Nigeria with a preponderance of risk factors for leishmaniasis have only a report by Ikpeama and Obijuru in a 2013 study on bionomics of sandfly composition in Mbaise Imo State.

The diversity of Leishmania strains involved in cutaneous leishmaniasis and the unavailability of universally acceptable, safe, and effective vaccines makes the treatment of patients difficult (Okwor et al., 2012) and the disease continues to engulf new regions. The transmission cycle of leishmaniasis is highly dependent on the interaction of the sand fly vector and the mammalian host. As stated earlier, anthropometric and environmental changes observed daily could change the composition of the sandflies population and increase leishmaniasis transmission. Therefore, it is necessary to update data on the species composition of the vectors of leishmaniasis.

Personal protection and source reduction of the vector remained an effective tool in the prevention of cutaneous leishmaniasis (WHO, 2010, Saberi et al., 2012, CDC, 2014). However, the adoption of preventive measures strongly depends on the attitudes and behaviors of the population at risk (Khan et al., 2013, Lopez-Perea et al., 2014). Therefore, to control leishmaniasis, it is essential to know the risk factors associated with it and to understand the disease-related knowledge, attitudes, and practices (KAP) of the population (Lopez Perea, et al, 2014). This underscores the need to study the knowledge, attitude, and practices towards sandfly and cutaneous leishmaniasis.

Materials and Method

Study Area

Ikeduru local government area of Imo State, southeast Nigeria, West Africa situated between the latitude of 5.5812oN and longitude of 7.1575oE with Iho as the headquarters. It has a population size of 178, 481 (NCC, 2006). It is a sub-urban community housing a substantial number of the people working in the state capital, Owerri.

The study has typically tropical rainforest vegetation, with several freshwater bodies, and there is ongoing deforestation for agricultural, domestic, and industrial purposes which exposes the population to sandfly bites. The inhabitants have different occupations, however, most people are engaged in subsistence farming, fishery, Palm wine tapping. They keep live stocks and piggery around their home, most of the time in their backyard, hence providing an epidemiological environment for the breeding of sandfly and encouraging fly-human contact. It is an enlightened community with several schools and health establishments.

Data Collection

The study was a community-based cross-sectional survey conducted between March to September 2019. The ethical clearance for this study was gotten from the Ethical Committee of the Department of Animal and Environmental Biology, Imo State University Owerri. A letter from the Head of Department was used to introduce the researchers to the Village Heads whose assistance was sought after enlightening them on the aim and significance of the study.

Knowledge, Attitude and Practice (KAP) towards Sandfly and cutaneous leishmaniasis

For the collected data for KAP, the names of all villages in Ikeduru L.G.A. were listed and three from each village is selected using simple random sampling. In the second stage, 183 households were selected from the villages using systematic random sampling to obtain numbers of caregivers/interviews. Data were collected using a pretested structural

ques5tionnaire specifically developed for the study. The respondent was defined as a mother, a father, or any adult responsible for the care of a person in a household. This structured questionnaire was self-administered and comprises of 30 questions divided into three parts treating respondents' knowledge, practice, and attitude towards sandfly and cutaneous leishmaniasis.

Sandfly Collection

Sandflies were trapped monthly on three consecutive nights using Self- prepared light traps, sticky papers, and a human bait trap. Trapping was carried out in animal houses, bushes around human houses in three communities of the study area. The traps were placed between 5:00–6:30 p.m. and collected between 6:00–9:00 a.m. the next morning. Flies captured were preserved in 70% ethanol in labeled sample bottles and transported to the laboratory in the Department of Animal and Environmental Biology, Imo State University for analysis.

Sandfly Identification

In the laboratory, the insects collected were processed for mounting between slides and cover glass. This was achieved by passing the insect in phenol (85% for 24 hours), potassium hydroxide (10% for 12 hours), acetic alcohol (10% for 15 min), acid fuchsin (8-10 min), 700GL, 900GL, 50GL, and absolute alcohol (15 min each), oil of cloves (24 hours) followed by the standard protocol for dissection of sand flies with dissection pins (Singh and Phillips-Singh, 2010). The slides were examined for the presence of the parasite. Identification of sandfly species and differentiation of the sexes was carried out based on morphological characteristics using standard taxonomic keys (Singh and Phillips-Singh, 2010).

Result

The social demographic characteristic of the household respondent is shown in Table 1

Table 1: Social Demographic Characteristics of the Respondents

Number of households (n=183)

	Village			Total (%)
	Amato (%)	Amadara (%)	Amachara (%)	
Gender				
Male	36 (52.1)	27 (39.7)	20 (43.5)	83 (45.4)
Female	33 (47.8)	41 (60.3)	26 (56.5)	100(54.6)
Age(years)				
16 28	16 (22.2)	10 (18.2)	19 (30.2)	45(24.6)
29 – 40	20 (27.8)	17 (30.9)	23 (36.5)	60(32.8)
40 above	36 (50.0)	18 (32.7)	21 (33.3)	75(40.98)
Marital Status				
Married	13 (25.5)	28 (40.0)	15 (24.2)	56(30.6)
Singled	16 (31.4)	11 (15.7)	17 (27.4)	44(24.0)
Divorced	2 (3.9)	1 (1.4)	5 (8.1)	8(4.0)
Widowed	20 (39.2)	30 (42.9)	25 (40.3)	75(41.0)
Occupation				
Farmer	30 (50.0)	15 (22.7)	23 (40.4)	68(37.2)
Trader	15 (25.0)	28 (42.4)	17 (29.8)	60(32.8)
Civil Servant	5 (8.3)	3 (4.5)	7 (12.3)	15(8.2)
Student	10 (16.7)	20 (30.3)	10 (17.5)	40(21.9)
No in household				

5 or less	18 (32.7)	23 (37.7)	37 (55.2)	78(42.6)
6 – 8	24 (43.6)	26 (42.6)	20 (29.9)	70(38.3)
10 or more	15 (23.6)	12 (19.7)	10 (14.9)	35(19.1)
Habitant				
A wall made of bricks	3 (3.6)	4 (3.4)	5 (7.7)	12(6.6)
Wall without or few cracks	6 (7.1)	7 (5.9)	3 (4.6)	16(8.7)
Presence of ceiling	18 (21.4)	36 (30.5)	22 (33.8)	76(42.6)
No or few openings	2 (2.4)	6 (5.1)	5 (7.7)	13(7.1)
Presence of electricity	25 (29.8)	36 (30.5)	19 (29.2)	80(43.7)
Presence of pig / goat	30 935.7)	29 (24.6)	11 (16.9)	70(38.3)

The demographic status showed Amato has the highest number of respondents 69 (37.70%) while Amadara had 68 (37.68%) and Amachara the least value of 46 (25.13%) respondents. More females (54.6%) were examined than males (45.4%) and more than 40% of people were 40 years and above. The marital status of the study population consists of Single (24.0%), married (30.6%), divorced (4.0%) and widowed respondents (41.0%). Farmers have the highest number of respondents 68(37.2%) followed by traders 60 (32.8%) and students 40 (21.9%) while civil servants make up 8.2%. Different households living in different habitats that could encourage increased human-Sandfly contact were captured.

Table 2 shows the knowledge of sandfly among the respondents in the study area. The result revealed that 61.7% of the heads of households in Ikeduru could identify Sandfly, while 70 (38.3%) of the 183 respondents could not.

The majority of the respondents (55.7%) knew the breeding sites of Sandfly and the sites mentioned include animal house by 68.6% of the respondents, ground openings (15.7%), building cracks (86.3%), and Dirty places (65.7%). Only seven (6.9%) of the respondents incriminated trees as breeding sites of the sandfly.

Table 2 Knowledge of sandfly among the respondents in the study area

Questions	Response	
	Yes	NO
Identification		
Can you identify Sand fly	113(61.7)	70(38.3)
What is the common description?		
Small Brownish Gray insect	42(37.2)	
Small reddish insect	32(28.3)	
Medium sized insect	39(34.5)	
Do you know the Breeding sites of sandfly		
Breeding sites of sandfly	102(55.7)	81(44.3)
Animal house	70(68.6)	
Ground	16(15.7)	
Building Cracks	88(86.3)	
Dirty place	67(65.7)	
Trees	7(6.9)	
What is the peak biting time?		
Rainy Season	83(45.4)	
Dry Season	37(20.2)	
Both	63(34.4)	

The result showed that 34.4% of the respondents acknowledge no preference in the peak biting time of sandfly, while 45.4% identified the rainy season as peak biting time as against 20.2% of the respondents who mentioned the dry season.

Table 3: Control Practice on Sandfly among Respondent and Its Frequency

Question	**Response**	
	Yes(%)	**No(%)**
Do you know the control method?	110(60.1)	73(39.9)
Control method		
A Removal of Vegetation	60	20.8
B House Spraying with chemical insecticide	48	16.6
C House spraying with non-chemical insecticide	15	5.2
D Use of door and window nets	72	24.9
E Smoke	30	10.4
F Sanitation	51	17.6
G Others	10	3.5
Frequency of the control method	Number	(%)
A	38	12.0
B	42	13.3
C	61	19.3
D	28	8.9
E	53	16.8
F	61	19.3
G	33	10.4

Table 3: Shows Control Practice on Sandfly among respondents and their frequency. The result showed 110 respondents representing 60.1% of the respondents were aware of the control methods for sandflies. Among respondents that know the control method, 72(24.9%) respondents said it is by use of door and bed net, while removal of vegetation and sanitation were mentioned by 20.8% and 17.6% of the respondents respectively. The house is spraying with insecticides and non-insecticides were acknowledged by 16.6% and 5.2% of the respondents, respectively while smoking was mentioned by 10.4% of the respondents.

Table 4: knowledge of cutaneous leishmaniasis among respondents

Question	Response of respondents	
	Yes(%)	**No(%)**
Have you heard about cutaneous leishmaniasis	73(40.0)	110 (60.1)
Have you ever seen a leishmaniasis patient	23(12.6)	160(87.4)
Do you know the vector of the disease?	73(40.0)	110(60.1)
Vector		
Sand fly(N=73)	40 (54.79)	33(45.21)
House fly (N=73)	40(54.79)	33(45.21)
Insect (N=73)	40(54.79)	33(45.21)
Can it be transmitted from man to man?	63(34.4)	120(65.6)

The response of the respondents to the knowledge of cutaneous leishmaniasis is shown in table 4.

The result showed that a minority of the respondents (40%) have heard about cutaneous leishmaniasis, while 60% of the respondents were not aware of it. When they were asked if they have seen anyone suffering from cutaneous leishmaniasis, only 23 (12.6%) respondents said yes.

When the question " Do you know the vector of cutaneous leishmaniasis" was asked, 40 (33.3%) respondents said yes. They were able to implicate insects with 54.79% correctly mentioning sandfly, however, some of the respondents erroneously mentioned houseflies. On the transmissibility of the disease, 63 (34.40%) said that it could be transmitted from man to man.

Table 5: Attitude and practices related to CL among the respondent in the study area

Question	Response	
	Number	%)
What is the peak incident time?	83	45.4
Rainy Season	37	20.2
Dry Season	63	34.4
Both		
Is leishmaniasis Curable	Yes(%)	No(%)
Practice patient cure	113(61.7)	70(38.3)
Cleanliness	80(43.7)	
Use of bed nets		
Isolation of patient	61(33.3)	
diet		
Admission to hospital	42 (22.9)	
	33(18.0)	
	41(22.4)	
Precautionary measure		
Avoid diet	33 (18.0)	
Health education	41 (22.4)	
Avoid Unhygienic	58 (31.6)	
environment	61 (33.3)	
Bed net	81 (44.2)	
Insect Repellent	11 (6.0)	
I don't know		

Table 5 reveals the attitude and practices related to CL among the respondent in the study area. The result showed that 34.4% of the respondents acknowledged no preference in the peak biting time of sandfly, however, while 45.4% identified the rainy season as peak biting time, 20.2% of the respondents said it is the dry season. Furthermore, 61.7% of the respondents believe that cutaneous leishmaniasis is curable, while 38.3% do not agree. On the practice undertaken by patients, cleanliness was acknowledged by 80 (43.7%) of the respondents. The use of bed nets to control leishmaniasis was the opinion of 33.3%, while admission to hospital for treatment was the idea of 22.9% heads of household. A good diet to improve immunity against infection was acknowledged as a patient practice by 33 respondents.

Preventive measures for leishmaniasis practiced by the respondents are; avoiding some food (11.5%), health education (14.3%), avoiding unhygienic environment (20.4%), use of bed net (21.4%), and use of insect repellant (28.4%).

Table 6 : Source of information on sandfly and cutaneous leishmaniasis

Source	Number of Respondents(%)
Source of information	
Radio	80(43.71)
Television	46(25.1)
Print media	60(32.7)
Internet	34(18.5)
Friends/ neighbor/ teacher	70(38/2)

In the assessment of the source of information about sand flies and leishmaniasis, 80 (43.7%) of the 183 respondents assessed said that they got it through a radio program (43.71%), a Television program (25.1%), print media (32.7%), internet (18.5%) and friend, neighbor or teacher (38.2%).

The species composition of the Phlebotomine flies is shown in table 7

Table 7: Species composition of sandfly

	Species		
	P.pernculosus	*P. longicuspis*	Total
Number collected	309	240	549
Mean collection (N=24)	12.9	10	22.9
Relative Abundance	56.3%	43.7%	100

A total number of 549 sand flies were captured in 24 visits to the three sample sites for sample collection, given a mean of 22.9 sand flies collected per day. Two species of Phlebotomine sand fly were identified namely, *P. perniclosus* and *P. longicuspis* with a relative abundance of 56.3% and 43.7% respectively. Statistical analysis showed significant difference in the occurrence of the species ($X2 = 13.14$, $DF= 1$, $\alpha =0.05$).

Table 8: Sex Distribution in the study sites

Village		Sex	
	No. Collected(%)	Male %	Female %
Amato	167 (30.4)	69(41.3)	98(58.7)
Amudara	m203 (36.9)	86(42.3)	117(57.7)
Amachara	179 (32.6)	70(39.1)	109(50.9)
Total	549	225(40.9)	324(59.1)

The sex-related occurrence of sandflies showed that the female constitute of 59.1% of the captured flies, while the male species make up 40.9% (Table 8). The statistical analysis revealed a significant difference in the sex-related occurrence of sand fly in the study area. $X2=32$ $Df= 1$, $\alpha= 0.05$ .This sex pattern is reflected in all the study sites, however, Amudara

produced the highest number of captured sand fly (36.9%), followed by Amachara (32.4%), while 167 flies were recovered from Amato representing 30.4% of the captured sand fly.

DISCUSSION AND CONCLUSION

Cutaneous leishmaniasis which is transmitted by Phlebotomine sandfly is a neglected tropical disease of serious public health concern. This study was undertaken to reveal the species composition of sand fly and knowledge, attitude, and practice toward sand fly and cutaneous leishmaniasis.

The demographic characteristics of the respondents are representative of the population of the study area. The result showed that 61.7% of the respondents identify sand fly and more than 50% were able to mention the breeding sites. Sandflies are endemic in the study and the high frequency of sand fly and the painful bites must have informed the easy identification of the insect. However, only 27.1% of the respondents were aware that sandflies carry CL. People's awareness of a vector is important in the control program. Lack of information about the vector of CL is a matter of concern for the implementation of preventive measures against the disease because if people do not perceive sandflies as a public health concern they usually do not take proper action to protect themselves from sandfly biting. This result was different from the result of Saberi et al., 2012 which reported that 97.9% of students were aware that sandflies carry the CL, but only 28.6% were able to identify a sandfly and Hejazi et al., 2010 where only 13.9% of respondents had enough information about the characteristics of the sandfly. It was consistent with the findings of Alexander et al., 2002 study in Brazil, which revealed that 23.1% of the study population were able to describe the sandfly as the vector of CL.

The result revealed that 44.3% of the respondents could not identify the breeding sites of the sandflies. This is similar to Akram et al., 2013 report in Pakistan was 59.6% of respondents had a lack of information regarding breeding places of sand flies. For the control measures of sand flies, 60.1% were in the opinion that sand flies can be controlled with 24.1% mentioning the use of door and bed nets. A varying number of respondents correctly mentioned the removal of vegetation, the use of insecticides, the use of the smokescreen, and sanitation as a means of control of sandflies. However, almost forty percent (39.9%) were unaware of the control measures. The knowledge of the control measure is poor considering the good knowledge of sand fly and prevalent high biting rate in the study area. This observation is in contrast with the finding of Singh et al. (2013) in India, which revealed that most of the people were aware of the control and preventive measures. Communities need to know the breeding habitats, biting mode, or time and control measures to minimize the chances of vector- human contact. A good number of respondents were unaware of these facts. The nocturnal habits of the sandflies may make it difficult for people to recognize their habits.

The result recorded poor knowledge of cutaneous leishmaniasis with only 40% of the respondents acknowledging acquiring information through different information sources. Furthermore, on the presentation of sample pictures, 87.4% of respondents said that they have not seen anybody having lesions due to cutaneous leishmaniasis. The poor knowledge of CL could be a product of the poor knowledge of the vector (40%). The result is in contrast to 75% awareness among respondents in Sokoto, Nigeria reported by Awosan et al., 2013. Cutaneous leishmaniasis is mostly asymptomatic as the bite lesion resolves fast. The disease is probably suppressed by the immunity acquired by respondents in the endemic environment. Hence, the low frequency of observation of the skin lesion despite the observable high biting rate of sandfly in the study area. Equally disturbing is the assumption that CL could be transmitted from man to man. This could lead to stigmatization of infected people and may account for the reason the skin lesions were not reported.

A good percentage of the respondents recognized that the disease is treatable and equally were able to pinpoint several sound precautionary measures like the use of insect repellant and use of bed nets. However, a disturbing number advocated avoiding patients (12.7%), avoiding some food (11.5%) showing a poor knowledge of the transmission and

prevention of cutaneous leishmaniasis. Even among health workers, Awosan et al. (2013) reported poor knowledge of the treatment of CL.

The presence of the sandfly in the study area was confirmed by the identification of the Phlebotomine sandfly. The sandfly's fauna in the area is composed of *P. perniculosus* and *P Longicuspis* with the respective relative abundance of 56.3% and 43.7%. Sandfly is found in areas with 28-degree centigrade temperature and 40% humidity for growth and development like in the study area (Adamu, et al., 2012). Hence, the abundance of phlebotomine sandflies observed in the study area could be attributed to lower humidity during the dry season. The detection of *Phlebotomus* in the area is consistent with the reports of Lewis and Macmillan, 1961, Asimeng (1985) who reported species of *Phlebotomus* as the only probable vector of leishmaniasis in the northern savannah zone of Nigeria. The result could not isolate infected sandflies to indicate the active transmission of the leishmania parasite. However, a study with a more sensitive molecular diagnostic method could provide a different profile.

Female flies (58%) were more isolated than males (42%), which is at variance with Agwale et al., 1995 who recorded more males (69.57%) than females. Chaniotis et al.,1971 suggested that such disparity between male and female phlebotomine sandflies could be due to differential sex mortality wherein, some females die after completing a few gonotrophic cycles. The reason for the more females in this study cannot be explained scientifically, however, it could be as a result of the sample. The presence of more females could indicate a high inoculation rate of Leishmania in the study area as the female sand flies have been reported as the sex with transmission capacity. There was no significant difference in the occurrence of the sandfly in the villages sampled. This could be because the sites are within the same geographical region with similar parameters as studies have shown that the extent to which sand fly population densities vary throughout the year depends on the local climate, Garcia et al., 2005.

This result is the first report of the presence of possible vectors of cutaneous leishmaniasis in the study area. The respondents' responses showed good knowledge of sandfly but poor knowledge of its vectorial capabilities and cutaneous leishmaniasis (CL). There was a good attitude toward CL and sound practices towards the prevention of the vector and the disease. This result provides data valuable in mounting control programs on sandfly and public health enlightenment on cutaneous leishmaniasis.

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