Research Journal of Parasitology

ISSN 1816-4943

Academic Journals Inc.

www.academicjournals.com

Research Journal of Parasitology 4 (1): 22-27, 2009
ISSN 1816-4943

A Survey of Vectors of Public Health Diseases in Un-Disposed Refuse Dumps in Awka Town, Anambra State, Southeasthern Nigeria

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Abstract: A survey of some refuse dumps for the presence of vectors of public health diseases was carried out in Awka Local Government Area from March to May 2008. The refuse dumps were located at Amikwo/Kenneth Dike Street, Umuogbu (off Saint Faith), Unizik temporary site Junction, Awka stadium area and Iyiagu Estate (Diamond Hostels). Water traps, Snap traps, Sweep nets and Sticky traps were used for the collection of arthropods and vertebrate vectors. Arthropods collected included members of the family Muscidae, Scorpionidae, Blattidae and the Culicidae. Rodents were also caught. Houseflies were the most abundant 62 (48.1%), followed by Cockroaches 38 (29.5%), adult mosquitoes 26 (20.2%), rodents 2 (1.6%) and scorpion 1 (0.8%). The result shows the relative abundance of the vectors of parasitic diseases such as bacterial, protozoal and viral infections in improperly disposed refuse dumps. The abundance of these vectors suggests that vector-borne diseases may be prevalent in Awka due to large numbers of un-disposed refuse dumps. Proper disposal of refuse dumps in Awka to avert possible epidemic is hereby suggested.

Key words: Arthropod, bacteria, organism, mosquito, parasitic diseases

INTRODUCTION

The lapses associated with the collection, treatment and disposal of solid wastes especially in the developing nations, often results to pollution of the soil, water and air. This creates breeding grounds for biological vectors such as insect pests and rodents, which could cause public health problems. The quantities of solid wastes generated in urban cities on daily basis are quite enormous. In Oyo, Nigeria, it was estimated that the quantity of solid waste generated daily in 2007 was 50.90 ton (Afon and Okewole, 2007). The study recommended additional 1.3 acres of land for proper waste management.

In Nigeria as well as in most developing countries, the urban landscapes are littered with garbage, plastics, bottles, disposable cups, discarded tires and even human and livestock faeces. These wastes are aesthetically unpleasant, constitute eyesores, produce unpleasant odour especially when their organic compositions are acted upon by putrefying bacteria. These refuse dumps thus constitute a habitat for vector, vermin and other nuisance organisms capable of transmitting or causing diseases such as typhoid, infantile diarrhea, and cholera in humans and animals (Siboe *et al*., 1996; Guevart *et al*., 2006). A report from Bangalore indicated the great potential of disposal sites in spreading epidemic/diseases to people living in their immediate vicinity (Lackshmikantha, 2006).

These pathogens including bacteria, viruses, protozoa and intestinal worms causes diverse diseases. Of particular concern are the cyst-forming protozoans that cause giardiasis and amoebic

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dysentery which have the common housefly as the vector. The houseflies breed and frequently visit human homes where they crawl over food and household utensils depositing the pathogens as they do. Their survival and capacity to transmit diseases are directly linked with putrefying solid wastes. Increased incidence of cancer and asthma has been reported in houses built on a former dump area (Pukkala and Ponka, 2001).

The used tires and water-holding containers in the refuse dumps form breeding grounds for mosquitoes especially during the rainy season and these mosquitoes cause great suffering and economic loss because of their blood sucking habits and disease transmission. The spread of *Aedes albopictus* in the United States has been reported to be facilitated by used and waste tires (Novak, 1995). Food remains from homes and commercial stores found in the refuse attract rats and other rodents, which harbor ecto-parasites such as ticks and fleas that are vectors of dangerous diseases as relapsing fever and plague. Also, the rodents attract vermins and snakes to the sites making refuse dumps very hazardous to human health. Most of the urban centres in Nigeria are virtually littered with garbage and refuse dumps and the government and the people seem very unconcerned. This work is aimed at surveying refuse dumps in Awka metropolis with a view to identifying the public health vectors breeding in the dumpsites. The specific objectives of this study include:

- To identify and study some un-disposed refuse dumps within Awka municipality
- To identify vectors of public health interest breeding in the un-disposed refuse dumps
- To study the relative abundance of various vector species
- To suggest the public health implications of the study

MATERIALS AND METHODS

Study Area

The study was conducted in Awka town in Anambra State between March and May, 2008. Awka town is located between latitude 50° and 6°25N and 7°E and 8°E. It is a university town as well as the political capital of Anambra State. It is densely populated with 90% being the Ibos. Traditionally, the people of Awka are crafts men and itinerant traders. Today, it is composed of people from all works of life including university lecturers, civil servants, students, farmers, craftsmen and businessmen and women.

Study Sites

The field investigations were carried out in six sites, these are Amikwo/Kenneth Dike street, Umuogbu (off Saint Faith) area, Ifite roadside refuse dumps and Iyiagu Estate (Diamond Hostel).

Selection of Refuse Dumps

Awka, a densely populated town with numerous human activities has several refuse dumps scattered around the town with differences in their age, size and composition. Some are large deposits of refuse accumulated over the years while others are smaller but more recent roadside dumps. From all these refuse dumps, six strategic sites were selected for the purpose of this field observation with respect to their volumes, location and composition.

Methods of Vector Collection

Visual observation was employed to closely study the refuse dumps to understand their composition, while sticky traps, water traps, snap traps, sweep nets and Hand picking methods were used to collect the vectors.

Sticky Traps

The sticky traps were used for trapping smaller insects and cockroaches. The sticky trap was designed with plywood of about 60 cm length, 40 cm breadth and 2 cm thickness. The surface of the plywood was covered with bright coloured piece of cloth to attract insect vectors and pinned with thumbtacks. Castor oil and grease were applied on the surface of the trap. The sticky traps were then placed in horizontal and vertical positions in the refuse dumps. The insects were caught when they crept onto or alighted on or blown onto the sticky surfaces by wind.

Water Traps

The water traps were designed using plastic buckets of 7 L, which were three quarter filled with water. Detergent was added to the water to reduce surface tension and enhance wetting of the insects and other water-loving arthropods.

Snap Traps

Snap traps for rodents were set to trap rodents visiting refuse dumps for food. Baits like crayfish and pieces of bread were used to attract the rodents.

Sweep Net

This was used for catching mosquitoes and other flying insects. The sweep net was made with mosquito net, a quarter inch iron rod to form the rim and a wooden handle. An average of about 20 sweeps were carried out on a dump.

Handpicking

This was employed in catching other larger arthropods like scorpion, with the aid of forceps and hand gloves.

Preservation

The larger arthropod vectors like scorpions, centipedes and other invertebrate animals were preserved in specimen bottles using 70% ethanol, while mosquitoes were kept in a petri dish, on a filter paper, placed on moist cotton wool. They were later sent to the Department of Parasitology and Entomology Laboratory of Nnamdi Azikiwe University, Awka, for identification and processing.

RESULTS

This field investigation showed that the study area (Awka) has a large number of refuse dumps scattered all over the various districts. A total of 50 refuse dumps were observed, out of which twelve were selected and closely studied within the six locations of study. The selection was based on the compositions, location, possible ages and areas where vector-host contact were suspected by general observation to be high. Table 1 shows the locations, composition and possible ages of the refuse dump sites studied. The individual refuse dumps were quite similar in composition but different in their locations and ages. Paper, vegetable, discarded food materials typical of domestic wastes and faecal matter were common and were at various stages of decomposition.

Mostly arthropod vectors belonging to the Muscidae (housefly), Blattidae (cockroach), Scorpionidae (scorpion), and the Culicidae (mosquito) were caught. The houseflies were the most abundant with a total of 62(48.1%). The cockroaches were next in abundance with a total of 38 (29.5%), followed by adult mosquitoes with a total of 26 (20.2%) and only 1 (0.8%) scorpion was caught during the survey by hand picking method (Table 2). The vertebrate and invertebrate vectors collected with different traps and their relative abundance were shown in Table 3. Water traps collected

Table 1: The location, description, composition and possible ages of the refuse sites studied

Location	Description of location	Composition	Possible ages (months)
Amikwo (dike street) sites 1 and 2	Around human dwellings, mostly traders, students, with poor drainage system in the area	Domestic wastes such as used cans, disposable cups, broken dishes, polythene bags, plastics, paper, old tyres, faecal matter etc	2-5
Umuogbu (off Saint Faith) sites 1 and 2	Near Awka main market, banks offices, school, church and private homes	Garbage, old bags and clothings, empty cartons, polythene bags, discarded utensils, paper, empty cans etc	5-15
Ifite (roadside) sites 1 and 2	Bush path, roadside sellers, business centers, student hostels, roadside gutter	Paper, polythene bags, domestic garbage, old furniture, beverage tins, faecal matter, etc.	2-8
Awka stadium site 1 and 2	Craftsmen, roadside sellers, school, shops, burrow pit, med. Lab, some private homes	Industrial wastes like steel, strings, old tyres, paper, polythene bags, med. Lab disposables, domestic wastes	10-15
Unizik junction (temp.site) site 1 and 2	Food vendors, motor-park, roadside sellers, hotel, business centers, student hostels, banks, filling stations	Vegetable matter, disposable plates and cups, polythene bags, paper, beverage tins and empty cans, plastics, old shoes and clothings, broken wooden furniture etc.	5-10
Iyiagu estate (diamond hostel) sites 1 and 2	Private homes, provision shops, student hostels, business centers, guest houses, hair dressing salons, roadside sellers, bookshop, chemist store	Domestic wastes and garbage, paper, polythene bags, empty cartons and containers, disposable plates and cups, hair and hair products, animal dung etc.	3-5

Table 2: The arthropod vectors collected in the various locations studied

	Location							
Insect type	Amikwo	Umuogbu	Ifite	Unizik junction	Awka stadium	Iyiagu estate	Total	Percentage
Housefly	15.00	12.00	10.00	8.00	9.00	8.00	62	48.82
Cockroach	5.00	8.00	12.00	5.00	5.00	3.00	38	29.92
Scorpion	-	-	1.00	-	-	-	1	0.79
Mosquito	9.00	4.00	3.00	4.00	1.00	5.00	26	20.47
Total	29.00	24.00	26.00	17.00	15.00	16.00	127	100.00
Percentage	22.84	18.90	20.47	13.39	11.81	12.60	100	

Table 3: Vertebrate and invertebrate vector collection from different traps and their relative abundance

	Method of collection						
Species	Water trap	Sticky trap	Sweep net	Snap trap	Hand picking	Total	Percentage
Housefly	62.00	-	-	-	-	62	48.06
Cockroach	-	38.00	-	-	-	38	29.46
Scorpion	-	-	-	-	1.00	1	0.78
Mosquito	-	-	26.00	-	-	26	20.16
Rodent	-	-	-	2.00	-	2	1.55
Total	62.00	38.00	26.00	2.00	1.00	129	100.00
Percentage	48.06	29.46	20.16	1.55	0.78	100	

Table 4: Non-vector organisms trapped during the survey

Organism	Trap	No. collected	Percentage
Snake	Snap trap	1	1.92
Ants/wasp	Sticky trap/water trap	23	44.23
Biting midges	Water trap	28	53.85
Total non-vectors collected		52	100.00

62 insect vectors (48.06%), stick traps collected 38 insects (29.46%), sweep net 26 insects (20.16%) and snap traps caught two rodents (1.55%) giving a total of 129 vector specimens.

Table 4 shows that in addition to the presence of arthropod and vertebrate vectors found during the study, snake which from the time immemorial has been known as a threat to man was also trapped

in one of the locations (Ifite) on its activity of scavenging the refuse dump in search of food. Other organisms found were ants, biting midges and wasps.

DISCUSSION

A total of 50 indiscriminately located refuse dumps at varying decomposing stages were observed within Awka metropolis. This is probably an indication of poor sanitary condition in the state. Obionu (2004) noted that the greatest challenge to the environmental health in Anambra State and indeed Nigeria are those of municipal solid waste and human excreta. He further observed that bucket latrines and bush defecation are still in vogue in urban slums and rural communities while solid wastes block urban roads and provide breeding foci for disease carrying insects and rodents. Mogbo (2004) and Agu (2004) observed that environmental problems in Anambra State included gross inadequacy of basic sanitation, lack of portable water supply, dilapidated and poor quality houses infested by dangerous pests, vermins and rodents as well as air, water and land pollution occasioned by industrialization and urbanization. The indiscriminate accumulation of refuse dumps in cities are detrimental both to the inhabitants and the disposal industry operators (Colombi, 1991). It is therefore pertinent that efforts from the various arms of the society and the government of the country should be geared towards cleaner and healthier environment.

Arthropods vectors belonging to the families Muscidae and Culcidae (Diptera) and Blattidae (Dictyopetera) were found in all the study sites in contrast to vertebrate vectors which were found in two locations (Ifite roadside refuse dumps and Iyiagu Estate or Diamond hostel sites). The predominance of houseflies and cockroaches point to possible mechanical transmission of diseases. The relative abundance of mosquitoes breeding in the water holding containers found in the refuse dumps is indicative that malaria and other mosquito-borne diseases will be prevalent in the area (Onyido *et al*., 2006a, b). The finding of the present study is consistent with previous study in which similar small mammals capable of serving as reservoirs of pathogens and parasites were identified in refuse dumps (Vlcek, 1991). The result of this survey therefore underlines the hazards associated with indiscriminate dumping of refuse in cities. Siboe *et al*. (1996) reported the potential human danger resulting from moulds growing on crude garbage dumps in the vicinity of human habitation. Other research had also highlighted the detrimental effects of arbitrary refuse dumping in the cities (Lakshmikantha, 2006; Pukkala and Ponka, 2001).

The composition of the refuse dumps were mainly domestic wastes including vegetable matter, paper wrappings, tin cans, used tires, cartons, plastic and polythene materials. In a study of the implication of un-disposed refuse dumps in Enugu urban south-eastern Nigeria, Ozumba and Nwosu (2003) estimated the composition of the refuse dumps as follows-domestic and faecal organic matter 70%, plastic materials 20%, metal and glass materials 6 and 3% ,respectively, chemicals and others 1%. The impact of heavy metals from refuse dump on soil, foods and water quality in Awka, Nigeria has been reported by Nduka *et al*. (2008). The consumption of leafy vegetables and crops produced in contaminated soils may pose a health risk to those that reside around the refuse dumps. In fact, previous report has highlighted high frequencies of toxic methemoglobinemias in people living in the vicinity of refuse dumps (Pach *et al*., 1996). This study therefore calls for government attention to the public health dangers posed by un-disposed refuse dumps.

A good public health education is necessary to inform the inhabitants of Awka on the role of vectors in the transmission of parasitic diseases. This study recommends the practice of waste reduction, re-use and recycling.

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