

A Survey of Public Health Disease vectors Breeding in Refuse Dumps in Onitsha Metropolis, Anambra State Nigeria

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Abstract: The study was conducted to determine the public health disease vectors breeding in refuse dumps at Onitsha metropolis in Anambra State of Nigeria. The study was conducted between March and August 2009. Visual observations were used to estimate the age and composition of the refuse dumps. Sweepnets, sticky traps and water traps were used to collect different vector species. Snap traps were used to collect the rodents and other small animals. Twelve refuse dumps were selected based on their locations in the city and human activities in the areas. The refuse dumps were aged 3-5 weeks in the GRA and 2-5 months in the urban slums. Compositions of the refuse dumps varied from vegetable matter and animal remains to assorted materials including used tyres, electronic parts, cartons and hair-care products. Seven insect vector species, 2 reptiles, 3 snails and 6 rodents were collected from the refuse dumps. Out of 153 animals from the refuse dumps, 144(94.1%) were insect vectors of public health diseases. *Musca domestica* 60 (39.2%), *Culex quinquefasciatus* and biting midges 20 (13.0%) respectively and *Periplaneta americana* 19 (12.4%) were the most abundant vector species. The thriving populations of these vector species, the abundance of putrefying refuse dumps and human disease in the refuse dumps are suggestive of the endemicity of diseases transmitted by the vectors in the city. This work therefore recommends the urgent disposal of refuse in the study areas to improve both human and environmental health of the city.

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1. Introduction

Human activities including industrialization, urbanization, commercial and household activities lead to generation of large amounts of wastes in the environment. The waste production increases on daily basis (Ojiegbe, 2005a) and is compounded by population explosion, decreasing standards of living and low level of environmental awareness (Beg et al., 1985). The peoples attitude in littering the environment (Nwoke and Nwoke, 2006), the inadequate machinery of waste management by government (Ojiegbe, 2005a) and the poor management skills of the staff in handling of domestic wastes lead to the accumulation of wastes in the environment. In many cases, the refuse dumps are located wherever land is available without regard to safety, health hazards and aesthetic value of the environment (Ojiegbe, 2005b). The accumulation of wastes such as sewage, human and animal remains as well as pesticides and other household chemicals and their indiscriminate disposal poses grave hazard to

health (Lucas and Gilles, 1990; Adedibu, 1986; FGN 2005b). The dumping of these wastes on land, rivers, and other surface waters or into the air, can also cause destruction of the natural fauna and flora (Ajiwe et al., 2000).

The putrefying food remains from homes, eateries, and commercial stores found in the refuse dumps attract houseflies and provide favorable breeding grounds for them (Onyido et al., 2009c). The food remains from homes also attract rats and other rodents which harbor ectoparasites such as ticks and fleas which are vectors of diseases like plague. The liquid waste dumps form favorable breeding sites for mosquitoes especially during the rainy season. These mosquitoes cause great-economic loss to the nation through their blood sucking habits and disease transmission to man and livestock (Onyido, et al., 2009a). The insects like ants and houseflies in the refuse dumps attract lizards, snakes and other reptiles. The rodents also attract snakes to the refuse dumps thereby making the refuse dump sites very hazardous to human health.

In addition, municipal solid wastes contain appreciable quantities of pathogen from animal and human faecal materials in the garbage. These pathogens including bacteria, viruses, protozoa and intestinal worm stages cause diseases such as amoebic dysentery, infantile diarrhoea, hepatitis, skin diseases, typhoid and various forms of helminthiasis (FGN, 2005a; Ozumba & Nwosu, 2003). Ojiegbe (2005a) observed that apart from the unsightly decay of the garbages that stare at the neighbourhood dwellers every day, there is obnoxious smell and gaseous exchanges that pollute the aerial environment above the dumpsites. The present study was aimed at determining the prevalence of vectors of public health diseases in refuse dumps in Onitsha metropolis with a view to improving human and environmental health.

2. Materials and Methods

Study Area

The study was conducted in Onitsha town in Anambra State, Nigeria. Onitsha town is located between latitude 6° and 10° N and $6^{\circ}47'$ E. It is a commercial centre and a river port located on the bank of River Niger in Anambra State, southeast Nigeria. The city is flooded in most periods of the year by the River Niger.

The indigenous people of Onitsha are primarily of Igbo ethnicity, although there are other ethnicities, such as the Hausa, and Yoruba who have migrated to Onitsha. The population is mainly composed of traders (Businessmen and women), civil servants, craftsmen, students and farmers.

Geographically, it is within the rainforest zone of Nigeria and has marked wet and dry seasons (Iloeje, 2001). The area has about eight months of rainfall (March to October) annually, with annual rainfall range of 2000-3000mm. The dry season lasts from November to February with harmattan wind blowing for about four to six weeks between December and January. The area also has a mean daily temperature range of about $22-32^{\circ}$ C and a relative humidity range of about 70-80%. Furthermore, it is a city of relatively small landmass with many commercial activities. As a result of its teeming population and housing inadequacies, most inhabitants are poorly housed and thus lead to the prevailing slum in the city.

Selection and Study of the Refuse Dumps

Onitsha city has over a hundred and fifty refuse dumps scattered all over the metropolis. The study sites were selected based on their locations in the city and human activities going on in the

area. The locations were Fegge (Creek road and Ukpok Street), Upper New Market Road Odoakpu (Bida road), Awada (Oraifite Street) and the Government Reservation Area (GRA) (Omu Close). Twelve refuse dumps were selected for the study. Visual observation was used to closely examine each refuse dump to determine its composition and probable age.

Methods of Vector Collection

The following methods were used for vector collection, sticky traps, water traps, snap traps, sweep nets and handpicking method.

Sticky traps: The sticky traps were used for trapping smaller insects, cockroaches and small rats. The sticky trap was designed with plywood of about 60cm length, 40cm breadth and 2cm thickness. The surface of the plywood was coated with grease and was placed on the surface of the refuse so that the insects were caught when they crept into or were blown onto the sticky surfaces by wind.

Water traps: The water traps were made using plastic buckets of 5 liters, which were almost filled with water. Detergent was added to the water to reduce surface tension and enhance wetting of the insects.

Snap traps: Snap traps were set to trap rodents visiting refuse dump for food. Crayfish and pieces of bread were used as baits to attract the rats.

Sweep net: This was used for catching mosquitoes, houseflies and other flying insects. The sweep nets were made with mosquito net and metal rods to form the rim and a wooden handle. An average of about 20 sweeps were carried out at a dump between 8.00am and 10.00am in the morning for a better catch.

Preservation

Cockroaches, houseflies and other animals were kept in specimen bottles containing 70% ethanol, while mosquitoes were kept in a petridish containing filter paper placed over moist cotton wool. They were later sent to the Department of Parasitology and Entomology Laboratory of Nnamdi Azikiwe University, Awka, for identification and processing.

3. Results

The locations, composition and probable ages of the refuse dumps studied are shown in table 1. The refuse dumps varied in both their

compositions and probable ages according to human activities in the area. Fegge, one of the study areas, is a high density residential area with poor drainage systems. The inhabitants were mostly traders, craftsmen and janitors. The refuse dumps consisted essentially of such domestic wastes as vegetable matter, used tyres, cans, disposable cups, plates and spoons. Others were broken dishes and household utensils, polythene bags, plastics of all sorts, papers used tyres, faecal matter, sullage and so on. The probable ages of the refuse heaps were about 2-3 months.

The Upper New Market Road area is also a high density area but better planned than the Fegge Area. It is very close to the Onitsha main Market, with boutiques, shops, school premises, church and residential houses. Drainages were available but blocked with refuse. The composition of the refuse include vegetable matter, garbage, empty cartons and various types of wrapping papers, empty cans, broken bottles and polythene bags.

Odoakpu Bida Road area is equally a high density area with poor planning and poor drainage system. The inhabitants are mainly craftsmen, mechanics, roadside traders, food vendors, and few civil servants. The garbage in the area consisted of industrial wastes like pieces of metals, strings,

wrapping papers, old tyres, faecal matter and food wastes.

Awada Oraifite Street is also a high density area, better planned but with blocked drainages. Inhabitants are mainly traders civil servants and few craftsmen. The refuse dump is composed mainly of discarded electronic materials including CD plates, and electronic parts, vegetable matter, hair and hair-care products, animal and human dungs.

The GRA Omu Close is a low density area occupied by top civil servants and very successful businessmen and women. It has good functional drainages, magnificent residential buildings, shops and few supermarkets and retail provision stores. The refuse dumps contain mainly beverage tins, empty cartons, polythene bags, old shoes, clothing and broken wooden furniture. The ages of all the refuse dumps varied from 3 weeks to 5 months.

The highest collection of insects and other animals were made from Awada, while the least was from the Government Reserved Area (GRA). Also, the collection method that yielded the highest number of insects and other animals was water trap, while snap trap gave the least (Table 2,3).

Table 1: Location, Composition and ages of different refuse dumps at Onitsha Metropolis

Location	Description of Location	Composition of refuse dumps	Ages of the refuse dumps
Fegge (Creek Road and Ukpok Streets), Sites I & II	High density area. Poor planning & poor drainages inhabited by traders, craftsmen, janitors etc.	Used cans, vegetable matter, disposable cups, pots & plates, broken dishes, polythene bags, plastics, papers, old tyres, faecal matter sullage etc.	2-3 months
Upper New Market Road (Sites III & IV)	High density area, encroached by Onitsha main market. Blocked drainages and littered environment. School, church, boutiques & residential houses.	Household garbage, empty cartons, pieces of clothing, cartons cans, broken bottles, polythene bags etc.	4-5 months
Odoakpu Bida Road (Sites V, VI and VII)	High density area with poor drainage and poor planning. Inhabitants are food vendors, traders, civil servants etc.	Industrial wastes as pieces of metal, petrochemicals, empty tins, old tyres, faeces, food wastes cartons & paper wrappings.	2-3 months
Awada Oraifite Street (Site VIII, IX, X and XI)	High density area, better planned and blocked drainages with both residential and commercial buildings.	Discarded CD plates, old electronic parts, vegetable matter, hairs and hair care products, faeces.	2-5 months
GRA Omu Close (Site XII)	Residential homes, mostly traders, civil servants and students with good drainage system.	Beverage tins, empty cartons and polythene bags, old shoes and clothing, broken wooden furniture.	3-5 weeks

Table 2: Insects and other animals collected from different refuse dumps

Vector species	Fegge	Upper market new	Odoakpu	Awada	GRA	Total	%
<i>Musca domestica</i>	12	10	10	20	8	60	39.2
<i>Blatta orientalis</i>	2	-	-	3	-	5	3.3
<i>Periplaneta Americana</i>	4	6	-	6	3	19	12.4
<i>Aedes aegypti</i>	-	-	8	7	-	15	9.8
<i>Anopheles gambiae</i>	2	1	2	-	-	5	3.30
<i>Culex quinquefasciatus</i>	7	4	4	2	3	20	13.0
Biting midges	7	6	5	2	-	20	13.0
Snakes	1	-	-	1	-	2	1.3
Salamanders	-	-	1	-	1	2	1.3
Snails	3	-	-	-	-	3	2.0
<i>Rattus rattus</i>	-	1	1	-	-	2	1.3
Total	38	28	31	41	15	153	
%	24.8	18.3	20.2	26.7	9.8	100	

GRA- Government reserved area.

Table 3: Insects and other animals collected using different methods

Vector species	Handpicking	Water trap	Sticky trap	Sweep net	Snap trap	Total	%
<i>Musca domestica</i>	-	58	-	2	-	60	39.2
<i>Blatta orientalis</i>	2	-	3	-	-	5	3.3
<i>Periplaneta Americana</i>	3	-	16	-	-	19	12.4
<i>Aedes aegypti</i>	-	-	-	20	-	20	13.0
<i>Anopheles gambiae</i>	-	-	-	5	-	5	3.3
<i>Culex quinquefasciatus</i>	-	-	-	15	-	15	9.8
Biting midges	-	-	-	-	2	2	1.3
Snakes	-	-	-	-	2	2	1.3
Salamanders	-	-	-	-	2	2	1.3
Snails	3	-	-	-	-	3	2.0
<i>Rattus rattus</i>	-	-	-	-	2	2	13.0
Total	8	78	19	42	6	153	100
% Collection by trap	5.2	51	12.4	27.4	3.9	100	100

4. Discussion

Onitsha is a river port city and an important commercial centre. It witnesses a large daily influx of humans and cargoes of merchandise from both land and water and all these lead to generation of enormous amount of wastes in solid, liquid or gaseous forms. Beg et al (1985) observed that the growth of human populations coupled with increased economic activities in towns and cities result in high rate of solid waste generation. Iloeje (2001) recognized that Onitsha is from inception a commercial centre which has attracted people from far and beyond the frontiers of Nigeria. In this connection, the need for careful planning and adequate allocation of resources to forestall a mismatch between the rates of waste generation, collection and disposal has been emphasized by the Federal Ministry of Environment Nigeria (FGN 2005d).

The refuse dumps varied in their compositions based on the human activities going on in their locations. Onitsha is a coalition point for many commercial and industrial activities. Consequently, the wastes generated varied from

degradable plant and silage to non-degradable papers and cartons, polythene materials, chemical toxicants in the form of pesticides. Others include petrochemicals from mechanic workshops and industries, detergents from homes as well as gaseous emissions from kitchens, abattoirs, industries, heavy vehicles and power plants (FGN 2005c; Odum, 1971).

The ages of the refuse dumps were between 2 and 5 months. This shows that the refuse dumps were not only unsightly but were decomposing and emitting odors to the inhabitants of the areas. Colombi (1991) pointed out that the indiscriminate accumulations of refuse dumps in cities are detrimental to both the inhabitants and the disposal industry operators. Wastes left unattended to for a long time constitutes serious health hazard, causes offensive odor, and emits poisonous gases to the atmosphere. Besides decreasing the aesthetic appearance and air quality, refuse dumps can as well pollute underground water sources (Ojiegbe, 2005b).

Seven insect species including *M. domestica*, *B. orientalis*, *P. americana*, *A.*

gambiae, *C. quinquefasciatus*, *A. aegypti* and biting midges were collected from the dumpsites. *M. domestica*, a notorious / mechanical transmitter of filth diseases especially cholera, amoebiasis, typhoid and helminthiasis (Onyido et al., 2009c) was the most abundant species collected. This indicates the probable endemicity of such diseases in the city as the environmental conditions (warm humid climate), aetiological sources of infection (faecal materials in the refuse) and human population for the maintenance of infections abound.

B. orientalis and *P. americana*, are among the medically important cockroaches out of over 4000 known species. They are involved in the mechanical transmission and harborage of various pathogens, viruses, bacteria, protozoa and helminthes (Service, 1980; Rivault et al., 1993).

Among the mosquitoes, *A. aegypti* are vicious indiscriminate biters responsible for the transmission of arboviruses especially yellow fever virus (Bang et al., 1980; Onyido et al., 2008). *C. quinquefasciatus*, a night-biting mosquito in the urban areas transmits the filarial worm, *Wuchereria bancrofti*, to man (Onyido, et al., 2009a), while *A. gambiae* is the world's most efficient malaria vector (Onyido et al., 2009b). The biting midges apart from biting nuisance and allergic reactions are equally responsible for the transmission of filarial worm, *Dipetalonema streptocerca*, to man in West Africa (Service, 1980).

Snakes, salamanders, rats and snails collected from the refuse dumps are strong pointers to the hazards of refuse heaps around human dwellings. While the rats may serve as reservoirs of harmful human pathogens (Ross & Piper, 2007, Onyido et al., 2009c), snakes are poisonous and their bites can cause instant death depending on the species (Spawls et al., 2004).

The findings of the present study are consistent with studies carried out by Ojiegbe (2005a & b), Siboe et al., (1996) and Nduka et al., (2008). In addition to other health dangers posed to the public by refuse dumps, the refuse dumps provide excellent breeding ground for the vectors of communicable diseases including insects and rodents. This calls for immediate attention of the concerned government agents to avert the dangers of imminent epidemics to the public in our cities.

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