



## Research Article – Biological Sciences

# Studies on mosquito density in urban Kano: A study to calculate larval indices in municipal area of Gwale, Kano, Nigeria

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(Received: 08-11-2019; Accepted 20-12-2019; Published Online 30-12-2019)

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### Abstract

The study is carried out to standardize larval indices namely House Index, Container Index and Breteau Index and also to identify the major breeding sources of mosquitoes in the residential environment in and around the Gwale Local government area of Kano, Nigeria. A cross-sectional study by selecting 50 houses randomly from the 6 wards of Municipality was employed. Every water holding container indoors and outdoors were counted and searched for larval presence and noted on a pretested format. In this study, 300 houses were surveyed in 21 days out of which 94.33% (283 houses) were found to have potential sources for mosquito breeding. All the entomological indices were found to be above the critical level. House Index = 28.67%; Container Index = 12.14%; Breteau Index = 64.00% showing high chances for outbreaks of mosquito borne diseases. The area is prone to mosquito borne disease like malaria and therefore warrants interventions from the competent.

**Keywords:** Vector survey, breeding sites, House Index, Container Index, Breteau Index, malaria

### Introduction

Nigeria is the 14th largest country in Africa. It has 923,768 square kilometres of total land area. Nigeria is 7th largest country in the world in terms of population and largest in Africa. Nigeria lies in sub-Saharan Africa. The population of Nigeria is approximately 177.1 million. Nigeria is lower middle income country (WHO, 2015). Malaria is one of the most important public health problems in the world. According to Malaria Report 2011 of World Health Organization approximately 106 countries are at risk of transmission of malaria in the world. In 2010 a total of 216 million malaria cases occurred, in which 81% were reported in African Region, 13% in South East Asia, 5% in Eastern Mediterranean Region (World Malaria Report, 2011)

Most Nigerian cities are epitome of urban decay and characterized by poor housing, sanitation and public health infrastructure (Akinbiyi, 1992). Their erratic growth of housing units coupled with rapid population explosion has resulted in environmental health hazards (Adefemi and Awokunmi, 2009). Wastes are generated from human activities and in most cases not properly managed in most Nigerian cities (Aurangabadkar *et al.*, 2001). This leads to low environmental quality which accounts for 25% of all preventable ill health in the world (WHO, 2002). In most cases, wastes are collected and disposed off in uncontrolled dumpsite sited near residential buildings. These wastes are heaped up and/or burnt, polluting water resources and air (Akpan, 2004, Uffia *et al.*, 2013).

Poor waste management systems constitute the major causes of diseases in Nigeria, of which malaria ranks the highest (Africa Development Bank, 2002). Other waste related diseases include typhoid fever and cholera. The purpose of our study was to investigate a possible correlation between waste collection methods in use and the incidences of malaria. Does the solid waste collection system used in an

urban area correlate with the incidence of the malaria disease? The results will serve as a guide for the development of strategies to enhance the collection of waste from urban environments. The results will enable political leaders to appreciate the severity of the problem and to prioritise solid waste management in urban areas. Also, the results will serve as a basis for a public awareness campaign oriented at promoting healthy solid waste management strategies.

### Material and methods

#### Study Area

The study was conducted in 6 ward from Gwale Local Government area of Kano state 11°59'39.4"N, 8°29'55.3"E (Latitude: 11.994277; Longitude: 8.498687).

#### Study Design

This study was conducted as a Cross Sectional survey Sampling Technique: Houses were selected randomly from each of the six wards taking each ward as a cluster.

#### Sample Size

A total of 300 houses, taking randomly 50 houses from each ward.

#### Study Period

The study was conducted in 3 weeks during July 3th to 24th, 2019. .

#### Method

50 houses were randomly selected from each ward (6 wards). After getting the consent from the head of the house, the premises of the house are meticulously searched for all possible water collections and containers both indoors and outdoors. Details regarding potential mosquito breeding sites and those positive for larval presence are collected and

**Table 1:** Calculation of mosquito larval indices

Survey result		Larvicidal indices (95% CI)		
		House index	Container index	Breteau index
Total number of house surveyed	300			
Number of house positive for larve	86			
Total number of potential containers	1581	28.67%	12.14%	64.00%
Number of containers positive for larvae	192			

**Table 2.** Distribution of different collections with potential for culex / anopheles breeding and proportion of containers with larvae

Type of artificial water collections	Potential Water collections	Positive for larvae	Percentage of total +ve containers n=192
Tins	642	92	47.92
Flowerpots	289	12	6.25
Tires	341	43	22.40
Terrace	20	0	0.00
Pots	278	45	23.44
Tree holes	11	0	0.00
Total	1581	192	100

entered on a pretested performa. Care was taken to search both indoors and per domestic area for manmade breeding habitats like, cement tanks, metal containers, plastic drums, plastic containers, metal drums, grinding stones, mud pots, bottles, discarded containers, flowerpots, tires, polythene sheets, and also the natural breeding sites like coconut shells, tree-holes, plant axils. All containers containing any volume of water were considered as potential breeding sites. Every accessible water-holding container in and around the house was meticulously searched for the presence of immature mosquitoes. Every water-holding container was categorized according to the type of container or breeding site mentioned in the format. Larval presence identified by the wriggling movement was also noted. Houses with one or more positive containers were noted (Jesha *et al.*, 2015).

#### Data analysis

Descriptive analysis was done manually to calculate mosquito larval indices and the proportion of different types of containers.

#### Results

In this study a total 300 houses were surveyed from the 6 wards from Gwale Local Government Area. There were potential breeding sites (with or without larvae) in 296 houses (98.6%). Positive containers (with larvae) were present in 86 of these 300 houses showing a calculated house Index of 28.67% (95% confidence interval = 18.57 – 31.73). Out of 1581 artificial water collections with potential for anopheles breeding, larvae were identified in 192 leading to a calculated Container Index of 12.14% (95% C.I = 4.95 – 15.76) and Breteau Index of 64.05% (95% C.I = 68.46 – 81.59). All the entomological indices were found to be above the critical level for occurrence of outbreaks of mosquito borne diseases. This is depicted in Table 1.

The distribution of artificial water collections (sites or containers) with potential for breeding found on inspection of the houses and its premises and the proportion positive for larval breeding are shown in Table 2. The distribution of houses with containers positive for larvae was not similar, with much greater mosquito densities in some households than others. The main potential containers with chances for mosquito breeding were tins (642), followed by tires (341) and flowerpots (289). The main source where actual

breeding was detected in the peri-domestic area was discarded tins (47.92%) followed by pots (23.44%) and discarded tyres (22.40%).

#### Discussion

The results from the larval indices indicated that mosquito population in gwale local government was sufficient to promote the outbreak of Malaria. Appawu *et al.*, 2006 also reported similar case from Ghana. In the survey, Breteau Index (BI) was found to be 64.00% is above the critical level of 5% and 50% [12]. The House index (HI) in gwale was 28.67% which is above the critical level of 5% (Sheppard *et al.*, 1969) and below 50%. while The Container Index (CI) to be 12.14% which is above the critical level of 5% and below 50% (State Health Dept, Kerala, 2011). Comparison of the indices in our study was found to be in accordance with the finding of Sheppard *et al.*, 1969 and Kaushal *et al.*, 2014. Both House Index and Breteau Index which are considered better predictors than container index are well above acceptable limits. The House Index of 26.67% is far above the safe limit 10% and container index 12.14% is at par with the cut off 10%. The BI is well above 50% and hence the area studied is at very high risk for epidemics (State Health Dept, Kerala, 2011).

#### Conclusion

The study shows high larval indices well above the critical points. Thus it is evident that these areas are at very high risk for an outbreak of vector borne diseases unless serious action is taken with community participation. The study also concludes that the mosquito control activities are not fully effective in the area.

#### Recommendations

Further entomological studies to identify the type of mosquitoes are recommended. Based on this study Health Education and Community action Plans with the help of Municipal Health authority are recommended to reduce mosquito density thereby prevent disease outbreaks. Screening of vectors for the presence of malarial parasite will be an added advantage for successful control.

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