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# Surveillance of Dengue Vectors Mosquito in Some Rural Areas of Bangladesh

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**Abstract:** A 24 week survey was conducted in some rural areas of Bangladesh and found a total of 256 positive containers and a total of 9415 larvae. In an average a 25.80% larvae positive containers were found in Malikanda and 8.00% in Dohar sadar. *Aedes albopictus* (Skuse) were found in all the study areas, but *Aedes aegypti* were found only in Jahangirnagar campus (Savar) and Zingera (Keranigonj) areas. Percentage of positive houses was highest in Pachimde (35%) and lowest in Jahangirnagar (6%). *Aedes aegypti* (L.) larvae were found mainly in tyres, bamboo stumps earthen pots and coconut shells, whereas *Aedes albopictus* in all types of containers.

**Key words:** Rural mosquitoes, dengue fever, *Aedes, Culex armigeres*

## INTRODUCTION

Disease caused by arthropod- born viruses is increasingly significant public health problems. Virus causing dengue infects nearly 100 million people living 110 countries each year and spread over the tropical areas of the world[1]. Dengue Haemorrhagic Fever (DHF) is one of the ten leading causes of hospitalization in eight Asian countries[2]. Health threat posed by dengue is rapidly expanding world wide. Each year millions of people around the world are infected with dengue[3]. *Aedes aegypti* and *Aedes albopictus* are the important vectors of dengue viruses, which cause Dengue Fever (DF) and Dengue Haemorrhagic Fever (DHF). The last three decades have also caused frequent out breaks of the much more serious DHF in Southeast Asia[4]. Dengue out break took place in Dhaka, Bangladesh as early as 1964[5]. There was an outbreak of dengue fever and dengue haemorrhagic fever in Dhaka and other urban areas of Bangladesh[6] and subsequently by the following years. Dengue is an acute and painful disease which is often not lethal but dengue haemorrhagic fever may lead to Dengue Shock Syndrome (DSS), i.e., circulatory failure which is often lethal within 12 to 24 h. Dengue virus is transmitted almost wholly from man to mosquito and mosquito to man[7].

Both the species of *Aedes* mosquitoe breed frequently in man-made habitats, such as water-storage vessels, flower vases, water accumulations, discarded tins, vegetable waste and blocked gutters[8]. In Bangladesh *A. aegypti* was so far been collected from urban areas of Dhaka city[9-15] and Chittagong city[16, 17]. Before 2002 it was believed that *A. aegypti* was absent in rural areas of Bangladesh but for the first time Hossain *et al.*[18]. observed *A. aegypti* in some rural areas of Narsingdi district, Bangladesh. So far no survey in other rural areas have done.

Keeping in view of these, a necessity was felt of making an entomological survey in some rural areas to gain information of the density of *A. aegypti* and *A. albopictus* population in the rural areas of Bangladesh. This will help the physicians to take precautionary activities against dengue born disease. This paper records the findings of 24 week study (April to September 2003) in some rural areas of Bangladesh.

## MATERIALS AND METHODS

The survey was carried out in eight localities of the Dohar, Nawabgonj, Keranigonj and Savar thana areas, which are the administrative units of Dhaka district, Bangladesh. Two localities of each thana were randomly selected for study namely- Malikanda village and Dohar thana sadar of Dohar thana, Hazratpur village and Nawabgonj sadar of Nawabgonj thana, Zingera and Pachimde village of Keranigonj thana and Jahangirnagar University campus and Islam Nagar of Savar thana areas. Keranigonj is situated 1 km south, Savar is 50 km north, Nawabgonj is 35 km and Dohar is 50 km south from Dhaka metropolitan area. There was no piped water supply in the study areas except Jahangirnagar campus and Zingera. People reserve water in bucket, Motka, Pitchers,

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Cemented tank, Drum etc. The sewerage facilities in the areas are Kucha, Semipucca and Pucca latrines. Jahangirnagar campus and Zingera are semi urban areas. Malikanda, Hazratpur and Pachimde are ideal rural village and Dohar and Nawabgonj thana sadar and Islam Nagar have very little urban facilities.

The average temperature and rainfall are 27±5°C and 25±5 mm, respectively. Soil condition of all the areas is Clay Loam (CL) except Jahangirnagar and Islam Nagar areas. People of these areas are moderately educated. Most of the people of the study areas used mosquito net and few people use aerosol and mosquito coil. Mosquito larviciding is not practiced in these locations.

Mosquito larvae were collected from April to September 2003 (6 months). Routine collection was made from 20 houses of each location in a month. 120 houses were visited from each location in 6 months survey period. Collection was made from indoor and outdoor containers of the house. The two main categories of containers were found, artificial and natural containers. Natural container included tree holes, bamboo stumps, leaf axils, fallen leaves etc., which were found in outdoor location. Artificial containers were found both indoors and outdoors locations which included drum, bucket, pitchers, earthen pots, broken earthen jars, bottles, cans, cemented tanks, used vehicle tyres, motka etc.

Larvae were collected from different locations and kept in a labeled plastic bottle and were brought to the laboratory for identification and count. *Aedes* was identified up to the species level following Barraud[19] and Bram[20].

## RESULTS AND DISCUSSION

During the 6 months study period a total of 256 positive containers (Table 1) and a total of 9415 larvae (Table 5) were found. Three different genera of mosquito were collected from the study areas (Table 1). *A. albopictus* and *A. aegypti* were found in both natural and artificial containers (Table 2). Basio[21] found this species in both of the two containers in Philippines. After data analysis it was shown that 5.46% larvae of *A. aegypti*, 71.48% of *A. albopictus,* 14.84% of *Culex* sp. and 8.20% of *Armigeres* sp. were found in the whole study areas ( Table 3). *A. albopictus* were found in high density of all the locations, whereas *A. aegypti* found only in Zingera and Jahangirnagar areas (Table 1). In this study *A. aegypti* were found only one types of natural containers which is bamboo stumps. This species was not observed in leaf axils, tree holes and broken bottle (Table 2). The species was found mainly the artificial containers e.g., drum, motka and bamboo stumps etc. Nasiruddin[22] observed *A. aegypti* in bamboo stumps and tree holes in Dhaka city. Hossain *et al.*[23], Chowdhury *et al.*[14] found this species only in artificial containers.

*Armigeres* and *A. albopictus* were found in tree holes. Most of the *A. aegypti* positive containers were found in the indoor place of the houses except Jahangirnagar (Table 1). In Jahangirnagar this species were mainly found in bamboo stumps (Table 2).

Highest (397) and lowest (113) numbers of wet containers were found in Jahangirnagar and Nawabgonj sadar (Table 1), whereas highest percentage (25.80%) of positive containers were found in Malikanda and lowest (8.00%) in Dohar sadar (Table 4). A large number of wet

Table 1: Total and positive containers found in different study areas

| | | Positive containers | | | | |
|---|---|---|---|---|---|---|
| Location | Total wet containers | *A. aegypti* | *A. albopictus* | *Culex* sp. | *Armigeres* sp. | Total |
| Malikanda | 163 | - | 32 | 7 | 3 | 42 |
| Dohar sadar | 175 | - | 9 | 4 | 1 | 14 |
| Hazratpur | 208 | - | 23 | 8 | 4 | 35 |
| Nawabgonj sadar | 113 | - | 12 | 5 | 1 | 18 |
| Zingera | 206 | 8 | 16 | 2 | 1 | 27 |
| Pachimde | 189 | - | 28 | 5 | 5 | 38 |
| Janhangirnagar | 397 | 6 | 46 | 3 | 4 | 59 |
| Islam Nagar | 168 | - | 17 | 4 | 2 | 23 |
| Total | 1619 | 14 | 183 | 38 | 21 | 256 |

Table 2: Different types of positive containers found in different locations

| | Species | | | | |
|---|---|---|---|---|---|
| Container (indoor and our door) | *A. aegypti* | *A. albopictus* | *Culex* sp. | *Armigeres* sp. | Total |
| Bucket | 1 | 2 | - | - | 3 |
| Drum | 3 | 1 | - | - | 4 |
| Cemented tank | 1 | 1 | 1 | - | 3 |
| Motka | 2 | 5 | 2 | - | 9 |
| Earthen pot | 1 | 107 | 15 | 8 | 131 |
| Coconut shell | 1 | 32 | 6 | 5 | 44 |
| Bamboo stump | 2 | 7 | - | 2 | 11 |
| Leaf axil | - | 1 | - | - | 1 |
| Tree hole | - | 4 | 2 | 5 | 11 |
| Tyre | 2 | 2 | 3 | - | 7 |
| Broken bottle | - | 13 | 2 | - | 15 |
| Others | 1 | 8 | 7 | 1 | 17 |

Table 3: Percentage of mosquito larvae under different species

| *Mosquito* sp. | % of larvae found |
|---|---|
| *A. aegypti* | 05.48 |
| *A. albopictus* | 71.48 |
| *Culex* sp. | 14.84 |
| *Armigeres* sp. | 08.20 |

Table 4: Percentage of positive houses and positive containers in different locations

| Location | % of positive containers | % of positive houses |
|---|---|---|
| Malikanda | 25.77 | 20 |
| Dohar sadar | 8.0 | 11 |
| Hazratpur | 16.83 | 31 |
| Nawabgonj sadar | 15.93 | 15 |
| Zingera | 13.11 | 26 |
| Pachimde | 20.11 | 35 |
| Janhangirnagar | 14.86 | 06 |
| Islam Nagar | 13.69 | 12 |

Table 5: Number of larvae collected from different types of houses in different species

| Location | Types of house | No. of larvae | | | | Total larvae |
|---|---|---|---|---|---|---|
| | | *A. aegypti* | *A. albopictus* | *Culex* sp. | *Armigeres* sp. | |
| Malikanda | Kutcha* | - | 87 | - | 16 | 103 |
| | All tin** | - | 504 | 215 | 44 | 763 |
| | Semi-pucca*** | - | 345 | 156 | - | 501 |
| | Pucca**** | - | 110 | 73 | - | 183 |
| Dohar sadar | Kutcha | - | - | - | - | - |
| | All tin | - | 115 | 25 | 35 | 175 |
| | Semi-pucca | - | 438 | 92 | 14 | 544 |
| | Pucca | - | 72 | 51 | - | 123 |
| Hazratpur | Kutcha | - | 17 | 15 | - | 32 |
| | All tin | - | 613 | 247 | 52 | 912 |
| | Semi-pucca | - | 69 | 24 | 13 | 106 |
| | Pucca | - | 26 | - | 18 | 44 |
| Nawabgonj sadar | Kutcha | - | 13 | - | - | 13 |
| | All tin | - | 255 | - | 55 | 310 |
| | Semi-pucca | - | 127 | 54 | 8 | 189 |
| | Pucca | - | 85 | 47 | - | 132 |
| Zingera | Kutcha | - | - | - | - | - |
| | All tin | - | 37 | - | - | 37 |
| | Semi-pucca | 112 | 276 | 108 | 67 | 563 |
| | Pucca | 57 | 413 | 172 | - | 642 |
| Pachimde | Kutcha | - | 32 | - | 10 | 42 |
| | All tin | - | 754 | 58 | 61 | 873 |
| | Semi-pucca | - | 267 | - | 23 | 290 |
| | Pucca | - | 524 | 112 | 15 | 651 |
| Janhang-rnagar | Kutcha | - | 318 | 139 | - | 457 |
| | All tin | - | 105 | - | 7 | 112 |
| | Semi-pucca | - | 288 | 122 | - | 410 |
| | Pucca | 26 | 292 | 253 | 58 | 629 |
| Islam Nagar | Kutcha | - | 66 | - | - | 66 |
| | All tin | - | 5 | - | 19 | 24 |
| | Semi-pucca | - | 396 | 45 | 36 | 477 |
| | Pucca | - | 7 | - | 5 | 12 |
| Total | | 195 | 6656 | 2008 | 556 | 9415 |

Types of house, *Kutca- house made of mud except of tin and rod
**All tin- house made of tin and wood,
***Semi pucca- house made of tin, wood, cement and sand
****Pucca- house made of rod, cement and sand

containers of Jahangirnagar area is bamboo stumps. Percentage of positive houses were highest in Pachimde (35%) and lowest in Jahangirnagar (6%) (Table 4), because most of the houses of Pachimde area is independent and has a large premise.

Hossain *et al.*[18] collected *A. aegypti* from rural areas of Bangladesh. Contrary to the reports of Ahmed[24], *A. aegypti* was encountered in rural areas of Bangladesh. In this study this species was found in rural areas. The reasons may be the semi-urbanization of these areas and migration of the species from Dhaka city. Therefore dengue fever and dengue haemorrhagic fever may spread out in such areas.

Polluted drains, ditch and pond are the major breeding places of *Culex* mosquitoes[23] while this study found *Culex* sp. in earthen pots, coconut shells, tyres, tree holes, broken bottles etc. These containers are not the usual breeding grounds of *Culex*. Because of few stagnant polluted water breeding places they complete their life cycle in the unusual breeding grounds. *Armigeres* sp. were found in earthen pots coconut shells, bamboo stumps and tree holes. This species were not found in indoor containers (Table 2).

This study proves that *A. aegypti* has dispersed to the rural areas of Bangladesh. It is alarming that dengue may spread the whole country. So special measures should be taken to minimize *Aedes* mosquito population for the control of dengue fever and dengue haemorrhagic fever in rural and semi- urban areas as well.

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