Journal of Communicable Diseases
Volume 52, Issue 4 - 2020, Pg. No. 77-80
Peer Reviewed & Open Access Journal

Research Article

Vector Surveillance for Dengue, Chikungunya, Zika Virus and Yellow Fever at Three Blocks of Pakur Districts of Jharkhand, India

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DOI: https://doi.org/10.24321/0019.5138.202044

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How to cite this article:
Parkash V, Patel S, Bhan S, Thomas TG. Vector Surveillance for Dengue, Chikungunya, Zika Virus and Yellow Fever at Three Blocks of Pakur Districts of Jharkhand, India. *J Commun Dis* 2020; 52(4): 77-80.

Date of Submission: 2020-05-16
Date of Acceptance: 2020-12-12

A B S T R A C T

Vector borne diseases are a major public health problem in India. Dengue is endemic in almost all states and union territories. Aedes mosquitoes are known to transmit Dengue, Chikungunya, Zika virus and Yellow fever diseases to man in both rural and urban areas. Dengue has been restricted to urban area, but it has now spread to rural and tribal areas. An entomological survey was undertaken at selected villages of three Blocks of Pakur district i.e. Pakur, Maheshpur and Amarpada of Jharkhand to know the potential for the transmission of Dengue/Chikungunya, Zika virus and Yellow fever and thereby undertaking surveys of breeding places of the vector species in these area by assessing the vector indices i.e. House Index (HI), Breteau Index (BI) and Container Index (CI) along with virus antigen detection. The entomological indices of G aneshpura, Datiapokhar and Longbahra villages of Maheshpur block recorded very high i.e. HI-28.5, 15.0 & 10.0; BI-34.2, 15.0 & 10.0 and CI-11.8, 8.8 & 4.8 respectively. The entomological indices of Pakur block, villages Jamsherpur, Malipada and Gopinathpur showed HI-7.3, 3.3 & 2.3; BI-7.3, 3.3 & 2.3 and CI-3.5, 1.5 & 1.3 respectively. The entomological indices of Amarpada block, villages-Jagjitpur, Ambajora and Pakudh showed HI-6.6, 0.0 & 0.0; BI-6.6, 0.0 & 0.0; and CI-2.5, 0.0 & 0.00 respectively. However, surveys revealed highest vector indices at Maheshpur block, followed by Pakur block and Amarpada block. Local health authorities of Maheshpur, Pakur and Amarpada blocks need to take cognizance of these facts with the presence of breeding potential areas and to develop micro action plan for appropriate vector control measures along with vector surveillance on regular basis.

Keywords: HI, CI, BI, Vector Surveillance

Introduction

Mosquitoes are known to transmit Yellow fever, Dengue, Chikungunya and Malaria diseases to human population in both rural and urban areas.[1-3] The mosquito borne infections are presently spreading from endemic to non-endemic area i.e. tribal area. Dengue vector control envisages reduction of aquatic stages of vector species through source reduction

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by eliminating breeding habits. The eradication of Aedes aegypti (L) from Brazil was achieved during the 1930s following a highly organized surveillance.[4,5] Similarly, other larval control with more specific goals has resulted in reduction of dengue transmission in Australia, Indonesia, Thailand, and Brazil.[6,7] In India, Aedes aegypti is known principal vector of dengue fever while dengue virus has also been recently detected in Aedes albopictus.[8-16] This communication presents the findings of some entomological surveys carried out in three blocks of Pakur district of Jharkhand state of India to assess the status of entomological indices with regard to the vectors of Yellow fever, Dengue, Chikungunya and Malaria and to assess potential risk of disease transmission.

Materials and Methods

Entomological Surveillance

A vector survey was conducted at three districts i.e. Pakur, Maheshpur and Amarpada of Jharkhand state of India for the vectors of Yellow fever, Dengue, Chikungunya and Malaria. The larvae collected from different types of containers were reared in 12"X12" mosquito cages to confirm the species identity for the vector of Yellow fever, Dengue, Chikungunya and Malaria mosquitoes. From the field data pertaining to the breeding of vectors of Yellow fever, Dengue, Chikungunya and Malaria mosquitoes, various indices were calculated i.e. House Index (HI), Container Index (CI). The mean±SD for each index was calculated. House index represents the breeding prevalence of mosquitoes in surveyed houses in a locality. Container index represents prevalence of mosquitoes breeding in different types of water holding receptacles. For calculating proportion of positives containers, cumulative data for all the surveyed years of that particular place were taken into account.

Detection of Dengue Virus (DENV) in Mosquitoes

Larvae and adults were collected from the three districts i.e. Pakur, Maheshpur and Amarpada of Jharkhand state of India and brought to the Centre for Medical Entomology and Vector Management (National Centre for Disease Control, Delhi) for detection of DENV from mosquitoes by antigen-capture Enzyme Linked Immunosorbent Assay (ELISA) followed by standard protocol. Wild caught adult mosquitoes and adults reared from larvae were tested separately. Sex wise pool of 3-10 unfed *Aedes aegypti* mosquitoes were made and tested for presence of DENV using monoclonal antibody (MAb), D14G2 (1:1000) as capture antibody (broadly reactive against four serotypes of DENV) and MAb-peroxidase conjugate MAb 6B6C-1 as detector antibody (1:2000). The ELISA plate contained known DENV infected suckling mouse brain homogenate as positive control and the homogenate of uninfected adult *Aedes aegypti* as negative control. Mean±4 Standard Deviation (SD) Optical Density (OD) of the normal laboratory reared mosquito pools (negative control) were taken as threshold level and any divergence of OD of the tested mosquito population that crosses this threshold level is considered as positive for DENV transmission.

Result

Entomological Surveillance

Entomological Indices

The Detailed of survey at selected villages of Pakur district of Jharkhand, India are given in the table.

The entomological indices of Ganeshpura, Datiapokhar and Longbahra villages of Maheshpur block recorded are HI-28.5, 15.0 & 10.0; BI-34.2, 15.0 & 10.0 and CI-11.8, 8.8 & 4.8 respectively. The entomological indices of Pakur block, villages Jamsherpur, Malipada and Gopinathpur shows HI-7.3, 3.3 & 2.3; BI-7.3, 3.3 & 2.3 and CI-3.5, 1.5 & 1.3 respectively. The entomological indices of Amarpada block, villages-Jagjitpur, Ambajora and Pakudh shows HI-6.6, 0.0 & 0.0; BI-6.6, 0.0 & 0.0; and CI-2.5, 0.0 & 0.00 respectively (Table 1).

Table 1.Locality wise Entomological indices of entomological surveillance

Name of Block	Name of village	Name of PHC/ HSC	HI	CI	BI
Maheshpur	Ganeshpura	Barammasi	28.5	11.5	34.2
	Datiapokhar	Bhagaband	15.0	8.8	15.0
	Longbahra	Sonpatia	10.0	4.8	10.0
Pakur	Gopinathpur	Anjana	2.3	1.3	2.3
	Malipada	Sanajodi	3.3	1.5	3.3
	Jamsherpur	Beldenga	7.3	3.5	7.3
Amarpada	Ambajora	Amarpada	0.0	0.0	0.0
	Jagjitpur	Amarpada	6.6	2.5	6.6
	Pakudh	Chilgori	0.0	0.0	0.0

* House Index (HI), Container Index (CI) and Breteau Index (BI).

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202044

Detection of Dengue Virus (DENV) in Mosquitoes

A total of 14 pools of Aedes aegypti mosquitoes (male & female) were tested for DENV infection from three districts i.e. Maheshpur, Pakur and Amarpada of Jharkhand state of India. However, all samples were found negative for DENV (Table 2).

Table 2.Locality wise emergence of adult Aedes and other mosquitos' species

Name of block	Name of village	Total emerged adult mosquitoes			Identified adult *Aedes* and other mosquitoes species		
		Male	Female	Total pool	*Aedes aegypti*	*Aedes albopictus*	*Culex quinquefasciatus*
Maheshpur	Ganeshpura	18	22	2	40	0	0
	Datiapokhar	16	22	2	38	0	0
	Longbahra	6	18	2	24	0	0
Pakur	Gopinathpur	7	4	2	11	0	0
	Malipada	9	4	2	13	0	0
	Jamsherpur	8	15	2	23	0	0
Amarpada	Ambajora	0	0	0	0	0	0
	Jagjitpur	13	5	2	18	0	23
	Pakudh	0	0	0	0	0	0

Conclusion

The ecology of the three blocks is different from each other and shows different type of breeding potential i.e. Maheshpur-Earthen pots used for cattle feed, Earthen & Cemented containers used for water storage; Pakhur - Big & Kachha house, people stores the water in Earthen and metallic containers behind the residential area and keep their cattle behind their residence and Amarpada-people used to clean the floor by fresh cattle dung, cattle feeding in cemented tanks. The mother foci for the vector breeding remains in the cemented tanks and earthern pots and spreads overs to other metallic and plastic containers during the favourable conditions. As there is no regular mechanism of vector surveillance, community awareness and participation can play an important role in minimizing the breeding potential areas and thereby breeding places.

Local health authorities of Maheshpur, Pakur and Amarpada blocks need to take cognizance of these facts and develop a comprehensive micro action plan for appropriate vector control measures along with vector surveillance on regular basis.

Conflict of Interest: None

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ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202044

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ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202044