

SURVEY OF MOSQUITO DIVERSITY IN DIFFERENT AREAS IN AND AROUND LUCKNOW (U.P.) IN DIFFERENT SEASON

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Abstract:

To know the mosquito fauna diversity, present investigation was conducted at 4 sites of city Lucknow, Uttar Pradesh namely Neelmatha, Vrindavan colony, SGPGI & Telibagh. This study has been completed in one year (12 months) during 2018, while to collect information of mosquito vector fauna diversity in Uttar Pradesh state, survey of mosquito larvae has been conducted. 4 species of mosquito vector belonging to 3 genera have been recorded in investigation namely *Aedes*, *Anopheles* & *Culex*. *Culex quinquefasciatus* was the dominant genus followed by *Anopheles stephensi*, *Aedes albopictus* & *Aedes aegypti* while *Culex quinquefasciatus* was found throughout the year. The biodiversity index was higher during the month of September 2018 (0.74).

Keywords: Mosquito diversity, *Aedes*, *Anopheles*, *Culex*.

Introduction:

Mosquito born disease leads to serious health problem. Across the world, 500 million people suffer from mosquito born disease and each year 1.1+ million people dies as well (Madhumathy *et.al.* 2007). Due to urbanization in Lucknow, number of discarded containers are increasing day by day, due to which mosquitoes are developing in those containers and these discarded containers are becoming breeding habitat of mosquitoes, which have clear meaning that due to human ecology artificial breeding sites of mosquito larvae has been increased (Chen *et.al.*, 2009) [8]. At much extent it has been found in studies that *Aedes albopictus*, *Aedes aegypti*, *Culex quinquefasciatus* & *Anopheles* breeds in artificial habitat (Chen *et.al.*, 2009; Adeleke *et.al.*, 2008; Dass *et.al.*, 1998; Suganthi *et.al.*, 2014). Specially in these it has been seen that larva of Dengue mosquito makes artificial containers as their breeding place (Rajesh *et.al.*, 2013) and also it has been found that in urban areas due to change in environment Dengue incidence has been increased (Li *et.al.*, 2014). When this disease becomes severe then due to DHF/DSS mortality causes in adults & infants (Monath *et.al.*, 1994). Population of Dengue vector *Aedes aegypti* fluctuates according to rainfall, humidity & temperature, Dengue infection generally happens in rainy seasons when their population increases (Pandya *et.al.*, 1982). In Culicidae thirteen genera, *Aedes* vector has been kept in most dangerous species because for public health it's much dangerous across the world. Due to this disease in most of the countries there is the loss of mortality, low productivity & economy (Adeleke *et.al.* 2010). Larval control strategy (source reduction & suppression) is much effective method to get protected from mosquito born disease Singh *et.al.* 2006. Developed countries like United State of America, Europe such as Turkey, and this strategy has been proved as very much important method for the eradication of mosquito born disease (Kitron & Spielman, 1989; Mawangangi *et.al.*, 2009). Mosquito fauna diversity & disease transmission rate spreads due to global changes like climate changes, urbanization and population

movement (Sutherst RW). It is much essential to understand the faunal richness & diversity of any areas so that local authorities can run the control program. Nowadays in Indian scenario in each region, mosquito born disease has become epidemic like Dengue, Malaria & Chikungunya. Dengue & Chikungunya were commonly spread in Marthwada since 2005-2006 (Laxmikant Shinde, 2011). The objective of this study is to determine the species diversity of Mosquito vectors in Lucknow city.

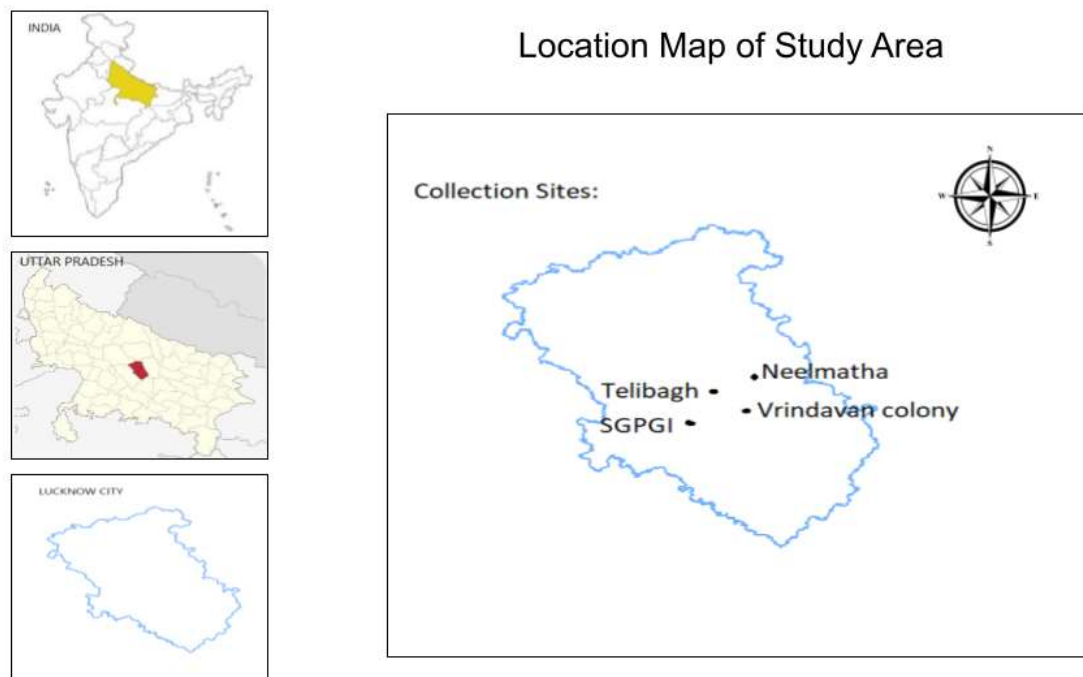


Fig 1: Sample collection sites

Materials & Methods:

Current study has been conducted in Lucknow, capital of Uttar Pradesh. It is situated at 26.30 & 27.10 North latitude and 80.30 & 81.13 East longitude 123 meter above sea level.

Study period:

This study has been conducted in 12 months of time period in 2018. This survey has been conducted in selected sites/areas of Lucknow like Neelmatha, Vrindavan Colony, SGPGI & Telibagh, at these places various types of artificial habitat were present of mosquito larvae.

Mosquito collection:

In mosquito larvae collection dipping method was used from different artificial habitat and natural habitat in which discarded containers, tyres, tree holes, cemented tanks, natural pond, stagnant waterbodies were included. Mosquito larvae were transferred in vials after collection and then were bought to laboratory for further identification & study.

Mosquito identification:

Collected samples were bought for identification in Lucknow University, Department of Zoology laboratory for adult emergence and these were morphologically identified on their species level by

the Entomology Consultant of CDRI, Lucknow, Uttar Pradesh using standard key & catalogues (Leopoldo 2004), (Nagpal *et al.*, 1995), (Barraud 1934), (Tyagi *et al.*, 2015).

Biodiversity index:

In this, species richness index & alpha diversity (Southwood, 1978) has been tested to calculate mosquito diversity.

Mosquito diversity formula is as follows:

$$\alpha = 1 - \sum (X1/t)^2 + (X2/t)^2 + \dots + (Xn/t)^2$$

Where,

α = Species richness index

t = Total number of mosquitoes of all species

X = Number of each species

Result:

In present study 4 species of mosquito diversity has been recorded, which belongs to 3 genera, named as *Aedes*, *Anopheles* and *Culex*. In this, 2 species of *Aedes* genus have been recorded, named as *Aedes albopictus* & *Aedes aegypti* while 1 species of *Anopheles* & 1 species of *Culex* as well, named as *Anopheles stephensi* & *Culex quinquefasciatus* (Table 1) has been recorded at all 4 sites. In this 4 area of studies Neelmatha exhibits high diversity of mosquito (1431) followed by SGPGI (1209), Vrindavan colony (1155) & Telibagh (1133) (Table 2). The differences which are being observed in mosquito diversity may be due to different type of habitat availability mismanagement (Pandian *et al.*, 1997).

During this present study, most maximum mosquito diversity September 2018 (0.74) & August 2018 (0.66), followed by July 2018 (0.62), April 2018 (0.59), October 2018 (0.58), June 2018 (0.56), May 2018 (0.55), May 2018 (0.53), January 2018 (0.47), & November 2018 (0.45) has been observed while lowest biodiversity was observed in December 2018 (0.38) (Table 3). *Culex quinquefasciatus* was dominant species found throughout the year collected from waterbodies. *Anopheles stephensi* was predominant species found from discarded containers while *Aedes albopictus* was collected throughout the period of study in higher density than *Aedes aegypti*. Both *Aedes* species were collected from water holding containers like tree holes, tyres, & cemented tanks. Mosquito species collected during study have medical importance. From study location Dengue, Malaria, Chikungunya, filariasis & Japanese encephalitis like dangerous disease-causing major vectors have been identified.

Table 1: Diversity of mosquito vector species recorded in study area during the study period (January to December- 2018).

S.No	Species name
1	<i>Aedes albopictus</i> (Skuse)
2	<i>Aedes aegypti</i> (Linn.)
3	<i>Anopheles stephensi</i> (Liston)
4	<i>Culex quinquefasciatus</i> (Say)

Table 2: Diversity and Relative abundance of mosquito vector species recorded in study area (Neelmatha, Vrindavan colony, SGPGI and Telibagh) during the study period (January to December – 2018).

S.No	Species name	Neelmatha	Vrindavan colony	SGPGI	Telibagh	Total
1	<i>Aedes albopictus</i>	304	279	350	361	1294
2	<i>Aedes aegypti</i>	165	144	160	126	595
3	<i>Anopheles stephensi</i>	452	309	339	300	1400
4	<i>Culex quinquefasciatus</i>	510	423	360	346	1639
	No. of species	4	4	4	4	
	Total	1431	115	1209	1133	4928

Table 3: Monthly variation in the diversity of mosquito diversity recorded in study area during the study period (January to December – 2018).

Sr. No.	Species Name	Species Diversity												Total		
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total		
1	<i>Aedes albopictus</i>	13	2	36	46	9	10	16	35	54	76	0	19	22	46	129
2	<i>Aedes aegypti</i>	6	20	23	28	24	23	38	42	59	70	0	12	14	595	
3	<i>Anopheles stephensi</i>	0	0	83	8	5	6	3	73	55	27	0	0	0	140	
4	<i>Culex quinquefasciatus</i>	25	22	26	10	12	25	20	74	80	31	0	12	163		
	Total No. of individuals	39	27	41	39	41	61	52	34	27	31	34	61	492		
	Species richness	5	9	2	4	4	4	5	3	0	8	5	2	8		
	Biodiversity index	3	3	4	4	4	4	4	4	4	4	2	3			
		0.	0.	0.5	0.	0.5	0.	0.	0.6	0.	0.	0.	0.			
		47	34	5	59	3	56	62	6	74	58	45	38			

Discussion:

Mosquito biodiversity study helps us in understanding the epidemiological aspects of potential mosquito vector species (Silva *et.al.* 2013). Present study has been first time approached in Lucknow, Uttar Pradesh to investigate diversity of mosquito larvae and has been also focused on its artificial breeding habitats, while these artificial mosquito breeding habitats are mostly temporary. In this current study, findings are according to work of (Anandh *et.al.* 2017) which was conducted in Tamil Nadu, where *Aedes*, *Anopheles* & *Culex* larvae reports were found while in another study conducted by (Amruthraj Radhakrishnan 2019) reported the presence of *Aedes*, *Anopheles* & *Culex* species. They found that *Aedes* vectors lay eggs in artificial containers & even in present finding also has been seen *Aedes* vectors laying eggs in different artificial containers and in studies (Dom *et.al.*, 2013), (Das & Mariappan 1998) & (Suganthi *et.al.*, 2014) had demonstrated that *Culex* & *Aedes* mosquito vectors makes artificial habitats as their breeding habitats, which relates present study as well. Two or more than two mosquito species have been identified in further study conducted by (Mohan *et.al.* 2014) such as *Aedes*, *Anopheles* & *Culex*. But few co-existing mosquito species were not observed in present study due to Temperature, humidity and absence of enough phytoplankton.

Previous studies have been conducted on relations (Ostfeld *et al.*, 2000) of species diversity & disease transmission risk in which it has been found that with low biodiversity (Ostfeld *et al.*, 2013) disease is potentially risky and have been suggested that higher biodiversity in human population can lower the disease transmission (LoGiudice *et al.*, 2003). Deforestation & rapid urbanization is responsible for promoting the mosquito vector species and transmitting various dangerous infectious diseases (Guerra *et al.*, 2006; Vanwambeke *et al.*, 2009). Changes in environment due to human activity is enough important for health authorities because by these activities risk of disease transmission can be changed.

Conclusion:

Present investigation in Lucknow provides the information about mosquito species diversity. In this present study 4 mosquito species have been recorded while biodiversity index was higher during the month of September (0.74). In Lucknow by the presence of mosquito vectors like faunal richness, Dengue, Filariasis, Malaria & Chikungunya it has been found that in Lucknow areas vectors surveillance must be intensified.

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