



Prevalence of mosquito diversity in and around Nagpur

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ABSTRACT:

Diversity of mosquitoes is distributed throughout the world and has occupied many niches including the higher altitudes. Effect of climatic factors like temperature, relative humidity (RH) and rainfall also have impact on the mosquitoes. Human being suffering from mosquito borne diseases such as, Malaria, Dengue, Filariasis, Japanese encephalitis, west Nile virus and Chikanguniya are the major diseases spread globally by different mosquito species. Mosquitoes are very well recognized as vectors of protozoan, viruses and other pathogenic organisms. The major tropical vector-borne diseases observed as an environmental consequence of underdevelopment, occurring in communities. Local mosquito distribution and flight range is dependent upon breeding habitat preference, availability of the host and resting preference. Results of the present study describe the mosquito species found in and around Nagpur, includes, *Anopheles stephensi*, *Anopheles subpictus*, *Anopheles culicifacies*, *Culex quinquefasciatus*, *Culex tritaeniorhynchus*, *Culex vishnui*, *Aedes aegypti*, *Aedes albopictus*, *Aedes vitatus*, and *Armigeres obturbans*. *Aedes aegypti* and *Aedes albopictus* are found in civil areas but *Aedes vitatus*, *Armigeres* are found in slum areas. These species exhibited special type of rhythmic pattern of behaviour during development. Majority of the *Anopheles* and *Culex* species are night feeders, whereas *Aedes* and *Armigeres* bite during day. The detailed behavioural patterns during different conditions have been reported.

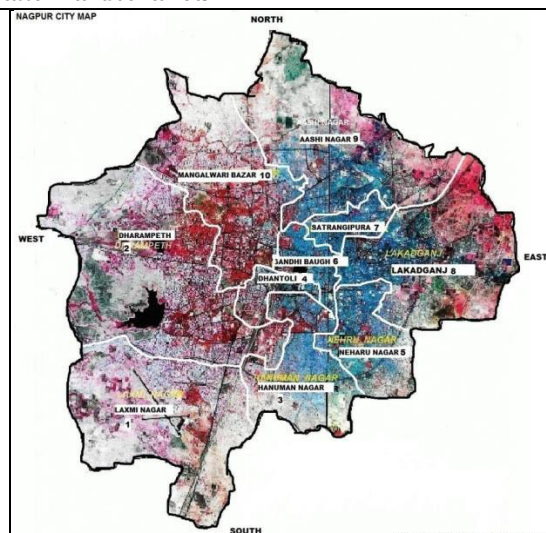
Keywords: Diversity, species, diseases, distribution, rhythmic pattern and behaviour

1. INTRODUCTION:

Mosquitoes are among the well-known groups of insects, because of their importance to Man as vectors of most distressing human diseases. Nearly three quarters of all mosquito species was found living in the humid tropics and subtropics (Collins and Blackwell 2000), (Toma et al. 2002). Mosquitoes are wide spread and diversified group of insects. More than 3500 species of mosquitoes belonging to 42 genera have been recorded under three subfamilies, Anophelinae, Culicinae and Toxorhynchitinae (Knight and Stone 1977). There are about 76 species in this genus. However they are not medically important. Unlike Anophelinae and Culicinae, both sexes of Toxorhynchitinae possess a proboscis, which is curved backwards, thus making them incapable of piercing skin and transmitting disease (Service, 1996). There are 3 genera in subfamily Anophelinae, however; only *Anopheles* is of medical importance (Service, 1996). There about 60 species of *Anopheles* known to be vectors of malaria (WHO 1997). Some *Anopheles* species are also transmitting filariasis and arboviruses (WHO 1997). Culicinae are the major vectors of arboviruses and filariasis, and important vectors of human disease (Manguin and Boete 2011). Medically most important genera in subfamily Culicinae are *Culex*, *Aedes*, *Mansonia*, *Haemagogus* and *Sabethes* (Service, 1996; WHO, 1997c). According to (Lehane, 2005) there are more than 2500 species of Culicinae of which the main genera are *Aedes* with over 900 species. *Aedes* is best known vectors of yellow fever and dengue fever. Some *Aedes* species are also vectors of some filariasis and viral disease (WHO, 1997c).

2. MATERIALS AND METHOD:

2.1. Study Area:



This study was carried out from July 2012 to June 2013 in and around Nagpur. The geographical location is, North Latitude – 21.07; East longitude – 79.07, heights above mean sea level – 312.42 mtrs. Nagpur located on the eastern parts and also known as second capital of Maharashtra. Nagpur Municipal Corporation, which is democratically elected civic governing body. The city is divided in ten zones. The average rainfall is 1205 mm (Max. 1993 and min. 606). Nagpur's Municipal limits encompass 217.56 Square Kms of land areas. There are several fine old reservoirs notably Shukrawari Talao, Ambazari and Telankhedi, Gorewada and many parks in and around the city. The study area divided into zones described below, Site 1 – zone 1 and 2, (south region), Site 2 – zone 2 (west region), Site 3 – zone 4, 6 and 7 (middle region), Site 4 – zone 5 and 8 (east region), Site 5 – zone 9 and 10 (north region).

2.2. Sampling:

Indoor collections was made by spraying pyrethrum with aerosol 0.6% (Pyrethrin synergised with 1.4% Piperonylbutoxide) to knock down the mosquitoes. The mosquitoes were picked and transferred to test tubes with mesh screen cover. Outdoor collections were also, both immature and adults were collected randomly from different sites the villages. Resting and biting adult mosquitoes were also collected in the evening between 6.00 to 8.00 pm near cattle shed and human dwellings using mechanical aspirator and human landing method. Outdoor collection was done at using sucking tube at light. The collected specimens were preserved in plastic vials for identification. Immature forms of mosquitoes were collected using dipper method (WHO, 1975) and reared in enamel trays under laboratory condition. Emerged adults were collected and stored in vials and all the collected mosquitoes were identified using pertinent keys. The collected adult were then identified using the standard keys, available in Centre for Research in Medical Entomology (ICMR) Madurai, (Cristophers S.R 1933), (Nagpal BN1995), (Smart JA 2003), (CRME 2012). The percentage (%) of population total collection, inter and intra generic variations of collected mosquitoes were compared (Rajesh et al 2014).

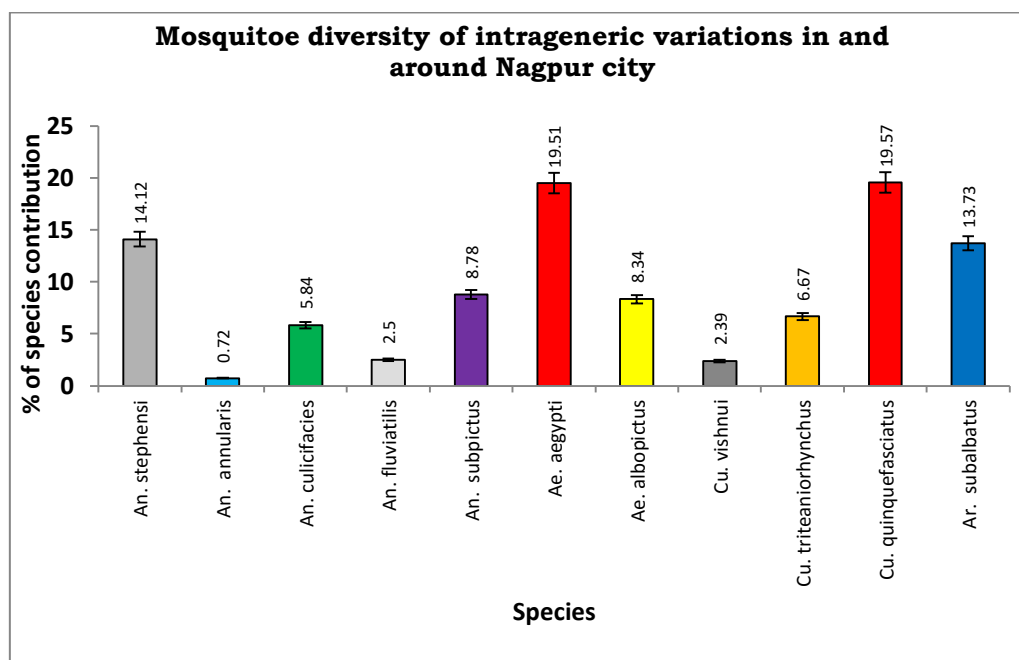
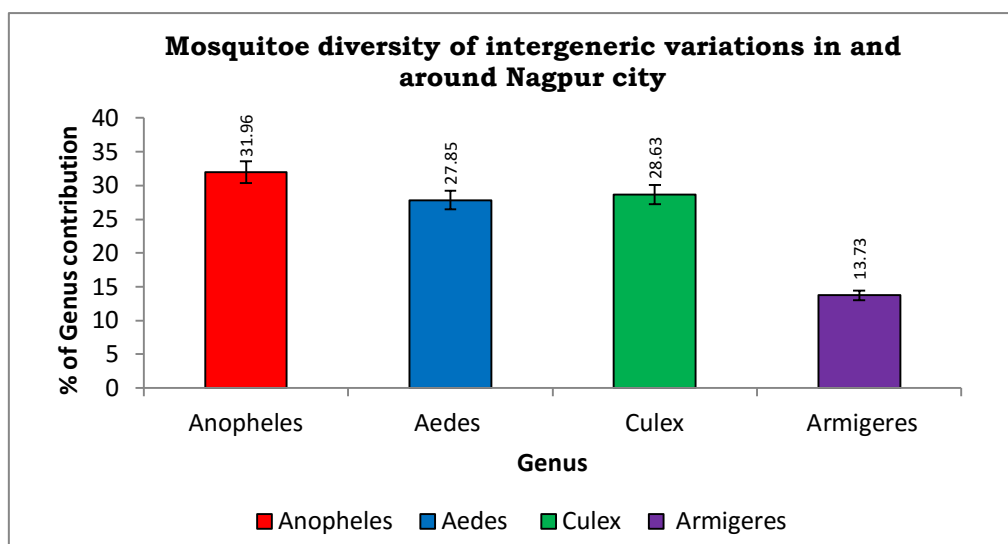
3. Results and Discussion:

The mosquitoes collected during the study period from different sites between July 2012 to June 2013 belong to 4 genera and 11 species. (Table.1) Total 1799 individuals were collected. Among the 4 genera of which *Anopheles* species was dominant with 31.96%,

mosquitoes, followed by *Culex* species, 28.3% and *Aedes* species 27.85%. Among species, the most dominant was *Culex* species representing 19.57% of total population followed by 19.51% of *Aedes* species. Abundant of total individuals found followed by *Aedes albopictus* (8.34%), *Aedes aegypti* (19.51%), *Anopheles stephensi* (14.12%), *Anopheles annularis* (0.72%), *Anopheles culicifacies* (5.84%), *Anopheles fluviatilis* (2.50%), *Anopheles subpictus* (8.78%), *Culex tritaeniorhynchus* (6.67%), *Culex vishnui* (2.39%), *Armigeres subalbatus* (13.73%). (Kazemi, et al., 2009) recorded a rich diversity of mosquitoes in five rural villages of Chabhar country, and out of 3824 adults and 5031 larvae of culicine mosquitoes in three months belonging to 5 genera and 17 species. (Thenmozhi and Pandian, 2007) collected 17 species of mosquitoes belong to 6 genera within two months in forest fringe of Alagar hills, Madurai among the mosquitoes collected during the genus *Culex* was the most dominant one (41.87%). *Culex quinquefasciatus* was recorded as the predominant species and they are most important vector of bancroftian filariasis, predominantly found in the tropics and temperate regions (Sharma, 2001). It is known as “house mosquito” and anthropophilic in nature. The larvae of this mosquito collected from open ditches, paddy fields, ponds and they thrive abundantly in stagnant dirty water (Mak, 1986, Hidayatiet al., 2005). The unregulated wastewater disposal and poor sanitation provide most suitable breeding sites.

TABLE 1: Mosquito population recorded in and around Nagpur.

S.No	Species	Total number collected	Share in population (%)	Intergeneric variations %	Intragenetic variations %
	<i>Anopheles species</i>	575	31.96	31.96	100
1	<i>Anopheles stephensi</i>	254	14.12		44.18
2	<i>Anopheles annularis</i>	13	0.72		2.26
3	<i>Anopheles culicifacies</i>	105	5.84		18.26
4	<i>Anopheles fluviatilis</i>	45	2.50		7.83
5	<i>Anopheles subpictus</i>	158	8.78	27.48	
	<i>Aedes species</i>	501	27.85	27.85	100
6	<i>Aedes aegypti</i>	351	19.51		70.06
7	<i>Aedes albopictus</i>	150	8.34		29.94
	<i>Culex species</i>	515	28.63	28.63	100
8	<i>Culex vishnui</i>	43	2.39		8.35
9	<i>Culex tritaeniorhynchus</i>	120	6.67		23.30
10	<i>Culex quinquefasciatus</i>	352	19.57		68.34
	<i>Armigeres species</i>			13.73	
11	<i>Armigeres subalbatus</i>	247	13.73		47.96
	GRAND TOTAL	1799	100.00	100	349.28



4. Conclusion:

In the present study, it was observed that, population of *Anopheles* was slightly less than *Culex* and *Aedes* species. The population shares of the local mosquito species in different locality are fluctuated. Thus the study suggested that population representation of an individual species will be determined using percent share of the individual population. The duration at appearance or development once determined then management strategies can be planned in advance and to control mosquito population and avoid loss of human life. Results of this study helps future planning of vector control measures and also support the NMC health department and vector control practices in India, regarding the decrease of Dengue, Chikanguniya, Filariasis, Malaria cases from selected areas and slums in and around Nagpur city.

References:

- [1] Christophers S.R (1933): The fauna of British India including Ceylon and Burma, Diptera. Family Culicidae, Tribe Anopheline, Taylor and Francis, London. Volume IV: Pp.1-371.
- [2] Collins, Larissa E and Alison Blackwell(2000): The Biology of Toxorhynchites Mosquitoes and Their Potential as Biocontrol Agents. Pp. 21(4).
- [3] CRME (2012): Mosquito key book, Identification key to mosquitoes of public health importance in India. Pp.62
- [4] Hidayati, H, Mohd Sofian-Azirun, Nazni, W.A. and Lee, H.L. 2005, *Tropical Biomedicine* vol22(1): Pp.45-52.
- [5] Knight, Kenneth L., and Stone A. (1977): A Catalog of the Mosquitoes in the World. *Agriculture* 6: Pp.611.

- [6] Kazemi, S.H., Vatandoost, H., Nikookar, H. and Fathian, M. (2009): Iranian J Arthropod- Borne Dis. vol3(1): Pp.29-35.
- [7] Lehane, M. J. (2005): *The Biology of blood sucking in insects* (vol. second edition). New York: Cambridge University Press. Pp.321.
- [8] Mak J.W. (1986), *Southeast Asian journal of Tropical Medicine and Public Health* 17.Pp.479-85.
- [9] Manguin., Sylvie and Boete C. (2011): Global Impact of Mosquito Biodiversity, Human Vector-Borne Diseases and Environmental Change. *The Importance of Biological Interactions in the Study of Biodiversity*. Pp.27–50.
- [10] Nagpal B.N. and Sharma V.P. (1995): *Indian Anopheles*, Oxford and I.B.H. Publishing Co. Pvt. Ltd. Pp.1-416.
- [11] Khatik R.K., Goyal S. and Agrawal M.K. (2014): Biodiversity of mosquitoes fauna of Tehsil Sironj, Vidisha, Madhya Pradesh, India, 2014.
- [12] Rozendaal, Ja. (1997, 2002): Vector Control: Methods for Use by Individuals and Communities. *WHO Library Cataloguing in Publication Data*. Retrieved Toma, Takako, Ichiro Miyagi, Takao Okazawa, Jun Kobayashi, and Susumu Saita.. entomological surveys of malaria in. Pp.33(3).
- [13] Service M.S. (1996). *Medical entomology for student*. Chapman and Hall (Vol. I). London.
- [14] Sharma VP. (2001): Health hazards of mosquito repellents and safe alternatives. *Current Science*, 80 (3). Pp.341-342.
- [15] Smart JA. (2003): Handbook for the identification of Insect of Medicinal Importance. Ed 2, Biotech Book, New Delhi, India. Pp. 295.
- [16] Thenmozhi V. and Pandian R.S. (2007): *Asian Jr. of Microbiol. Env. Sc.* Vol. 9 (4). Pp.819-824.
- [17] WHO (1992): Entomological field techniques for malaria Control, part I & II learner and tutor's UIDC, Geneva, Switzerland; World Health Organization. Pp.114.
- [18] WHO (1975): Manual on practical entomology in Malaria. Part II—Methods and techniques. Pp189.

