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Short Communication

Prevalence of *Armigeres obturbans* in the rural areas around Rajkot city, Gujarat, India

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ABSTRACT:

The intensive study was conuducted for the prevalence and distribution of *Armigeres obturbans* for the first time in the rural area surrounding Rajkot City. Seven villages were identified for the study species identification, larval density, adult density and distribution of breeding sites of the species. Results showed that adult density of *Ar. obturbans* during monsoon was highest and post monsoon period was most favourable for the species. Also the breeding sites of the species were recorded more during this period. While during winter season majority of temporary breeding sites dries out because of temperature decrease. Therefore, the temperature and rainfall are the two variables that showed major effect on the breeding activities of this species.

Keywords:

Armigers obturbans, Density, Breeding distribution, Rajkot, Rural.

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INTRODUCTION

Mosquitoes breed in water and being vector of many diseases transmit infections to the human being and animals. Different species of mosquitoes are spread in different place of the world, even at higher altitudes (Pemola and Jauhari, 2004). Along with modernization, land uses, agricultural development, canal irrigation and urbanization are modified by the people may contribute significantly to vector and disease transmission (Pemola and Jauhari, 2006; Douglas, 2004). The distribution and flight range of a mosquito species is dependent on their preference of breeding and resting site and also on availability of the host (Steven *et al.*, 2004). Different mosquito species shows specific types of behavioral activity patter, where the majority mosquito species rest during the day time and active just before dusk and end it just after the dawn (Brightmer and Fantato, 1998). During the last few decades, the insurgence and resurgence of various vectors and vector borne diseases have been increased due to unplanned growth of urbanization, increases use of insecticide and pesticides in the agro ecosystem, extreme deforestation and constructions of dams (Jagdish and Jagbir, 2003).

To evaluate the possibility of any mosquito control programme, first and for most requirements is the quantitative and qualitative entomological information of the species is required (Bhatt *et al.*, 1991). Since last few decades saurashtra region have facing mosquito borne diseases. Therefore the biggest problem to the local government body is to how to control disease spreading and vector population.

Many efforts are taken by the government and non government department to control vector population and spreading of disease but still mosquitoes are sustaining and dispersing diseases. There is lack of scientific baseline data on the mosquito species in the saurashtra particularly rural areas of Rajkot Taluka. Therefore, this study main aim is to create baseline data on the mosquito species. The objective of the study was to assess the larval and adult population structure of *Armigeres obturbans* (Walker) in Rajkot rural area.

MATERIALS AND METHODS

Study area and site section

Villages around Rajkot city were selected to carryout study on prevalence and distribution of *Armigeres obturbans* in domestic and outskirt shelters (Table 1). Selected villages, i.e. Sokhda (22.2379° N, 73.1050° E), Ronki (Latitude: 22.308155, Longitude: 70.800705), Naranka (Longitude: 70.777184, Latitude: 22.259392), Metoda (Latitude: 22.308155, Longitude: 70.800705), Madhapar (22.3248° N, 70.7720° E), Kankot (22.2404° N, 70.7363° E) and Kalipat (22.2364° N, 70.8826° E) (Figure 1) were ideal for the survey due to their livelihood dependency on agriculture and animal husbandry which are the most preferred habitats of the mosquito species. By considering this fact from around Rajkot city seven villages were selected for domestic and

Table 1. Mosquito larvae breeding and day time resting habitat preference of adult mosquito species around Rajkot city during 2006-2007

Breeding habitats	*Ar. obturbans*	Resting habitats	*Ar. obturbans*
Outskirt		**Human dwellings/ houses without cattle**	
Chekdam	-	Cemented houses	11%
Rivers	5%	Clay houses	15%
Rain Pools	7%	Huts	21%
Stagnant waste water	23%	Mixed dwellings houses with cattle	
Drainage***	64%	Cemented houses	18%
		Clay houses	13%
***Surface ditches drainage water		Huts	22%

outskirt larval sampling site and adult mosquitoes were collected by using methods and techniques describe as per WHO (1975a and 1975b). Based on the observation during the collection of specimen we have further categorized it into mosquito breeding sites and resting sites (Table 1).

Every month (1st January 2006 to 31st December 2007) larvae and adults speciemen were collected from the study sites. The survey was made to identify presence/absence status of larvae/adult from each and every types of domestic and outskirt sites in the selected villages. Sample size is fixed based on the number of houses in the selected villages and larvae samples collected within the 500m range from the domestic site. Six larval collection sites were fixed from the outskit habitats and ten larval collection sites were fixed from domestic habitats. For adult collection, nine sites were fixed in domestic habitats from each village and 15 minutes of time was spent in each site for adult collection.

At outskirt, six larval and domestic ten larval samplings done in each village. Total samplings in each village-16 once every month. Total two years sampling numbers = 384. For adult collection nine sampling was done in each village once every month. Total two years sampling numbers = 216. Above sampling. Every month done 1st January 2006 to 31st December 2007. Sampling was done every month for two year from same site and data has been analyzed. Total 384 samples for larval and 216 samples for adults have been collected.

During the survey, dipping method was used to collect the larvae specimen and the collected sample were kept in the standard plastic tubes and brought into the laboratory for identification and rearing. After that the collected larvae specimen were reared in standard plastics jars that are covered with cotton cloth containing the feed mixed with yeast and biscuit powder mixture (Joseph *et al.*, 2004; Das *et al.*, 2003; Helge *et al.*, 2002). While resting adult mosquitos were collected using aspirator and test tube by standard hand collection method. After collection, all the collected speciman were brought to the laboratory for species identification (Jagdish and Jagbir, 2003; Joshi *et al.*, 2005). Collected larvae and emerged adults from larvae were morphologically identified (Figure 2) up to the genus and species level as per Roy and Brown (1971), Patel (2002) and Vyas (2008). Collected data were analyzed to calculate the Larval Density (LD), average monthly and village wise larval and adult densities by using the formula LD = number of larvae collected / number of

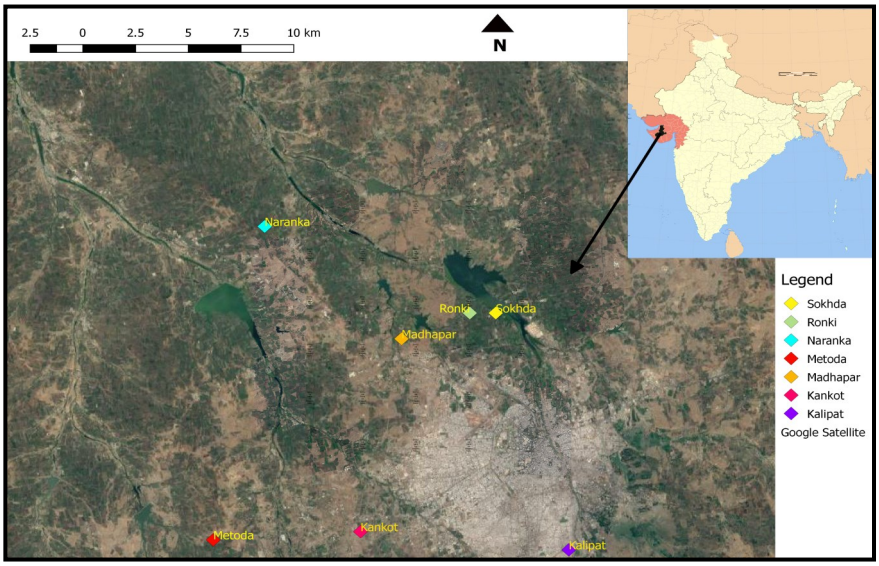

Figure 1. Showing study sites in the rural areas around Rajkot (Source: Google Satellite image)

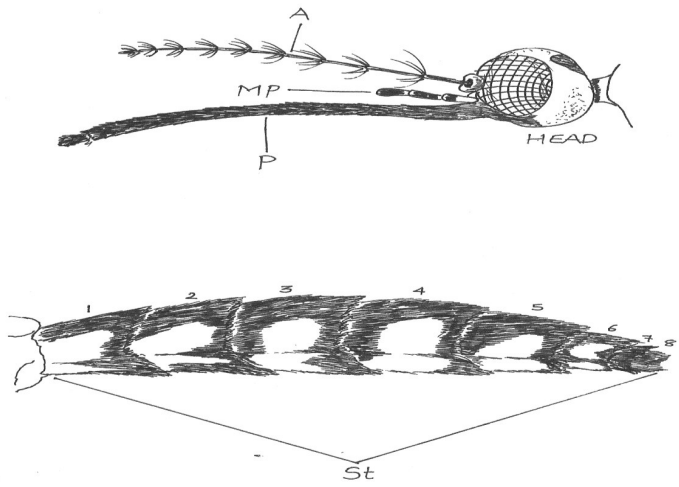

Figure 2. Morphological features for the adult *Armigeres obturbans* mosquito identification. Head: MP – Maxillary Palp; P – Proboscis; A – Antenna; Ab – Abdomen

dips made while adult density was calculated as Man per Hour Density (MHD) by the formula MHD = Total number of mosquito collected / Total time of collection (Vyas, 2008).

RESULTS

Armigeres obturbans species of mosquito were found during field collection at the different breeding place of study sites in the rural areas around Rajkot. *Ar. obturbans* is a predominantly outskirts breeder and found maximum to be as larvae (64%) from drainages, followed by ditches (23%), rain pools (7%) and river (5%) (Table 1). Larvae of this species were not recorded from any kind of domestic water collection vessels except one percent from cattle shed. Where as, *Ar. obturbans* resting places were recorded almost equally distributed among all kind of dwellings. It was observed that maximum adults were found resting in places like bathrooms and near drinking water stand. Among human dwellings maximum number of this

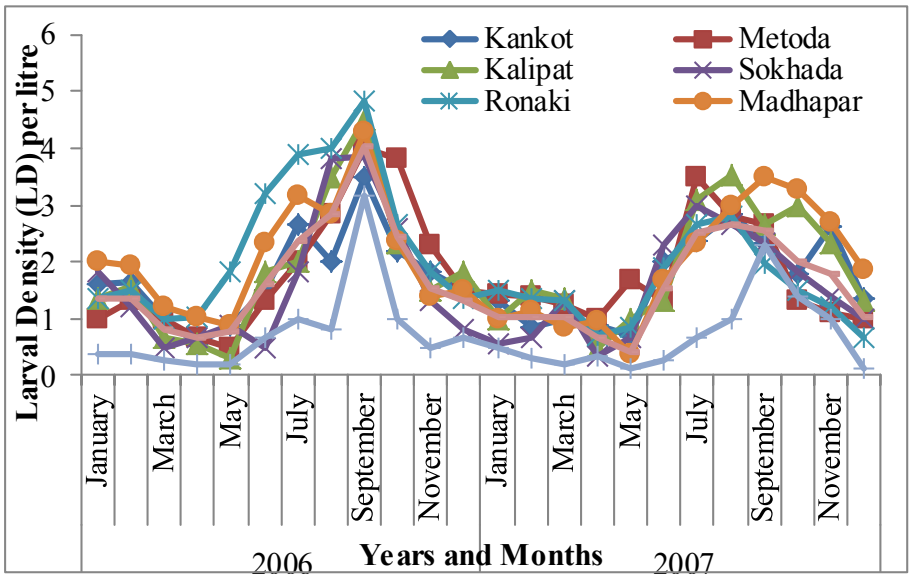

Figure 3. Monthly outskirt Larval Density (LD) per litre of sample water of mosquito *Armigeres obturbans* from the study area (n=24/village/month).

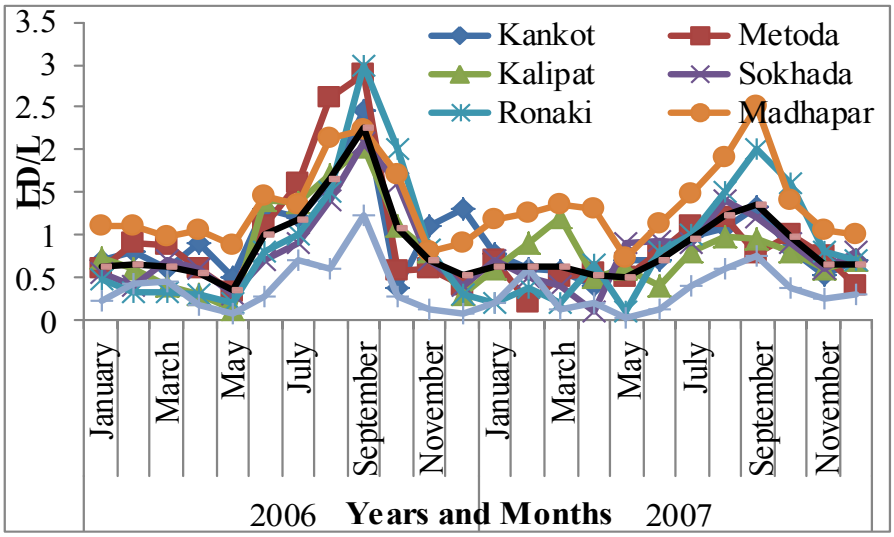

Figure 4. Monthly Larval Density (LD) in per litre of sample water stored in the tanks for domestic use of mosquito *Armigeres obturbans* from the study area (n=40/village/month)

species were recorded from huts (21%) followed by clay houses (15%) and cemented houses (11%) where as among mixed dwellings it was recorded as maximum from huts (22%) than cemented houses (18%) and clay houses (13%) (Table 1).

Average larval density of *Ar. obturbans* from the outskirt habitat was recorded maximum during the month of September (4.02) and August (2.66), while minimum density was recorded during the month of April (0.67) and May (0.40) (Figure 3). Where as village-wise average larval density of *Ar. obturbans* was recorded maximum at Ronki (4.83) and Kalipat (3.52) village and minimum was recorded at Naranka (0.18) (Figure 3). Average larval density of *Ar. obturbans* from domestic habitat was also recorded maximum during September (2.27) and August (1.24) and minimum density during May (0.35) (Figure 4). Village wise average larval density of *Ar. obturbans* from domestic habitat was recorded maximum at Ronki (3.0) and Madhapar (2.52) villages and minimum density was recorded at Kalipat

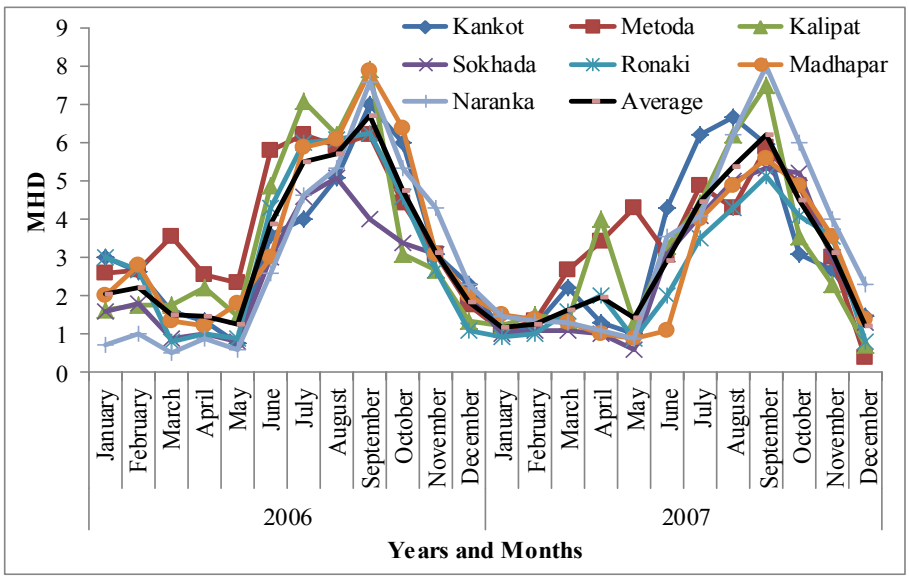

Figure 5. Monthly adult MHD of *Armigeres obturbans* from the study area (n=9/village/month)

(0.04) village (Figure 4). Average adult density of *Ar. obturbans* was maximum recorded during September (6.70) and minimum recorded during May (1.24) (Figure 5). Village wise average adult density of *Ar. obturbans* was recorded maximum at Madhapar (7.90) and Kalipat (7.51) villages in the years 2006 and 2007 respectively where as minimum density was recorded in Kankot (0.75) and Sokhada (0.60) villages in the years 2006 and 2007 respectively (Figure 4).

To check the effect of seasonal conditions and environmental factors on the mosquitoes, the monthly average adult density with the average total rainfall and average temperature were compared. Results of average adult density of the *Ar. obturbans* was recorded maximum during July (6.70) and Sept (6.21) in the years 2006 and 2007 respectively, while during this month total rainfall was 5.70cm and 4.10cm and average temperature was 28°C and 28°C recorded in the years 2006 and 2007 respectively. And minimum average adult density of *Ar. obturbans* was recoded during May (1.19) in both the years while during this month average temperature was 33°C and 34°C and with no rainfall in both the years. Therefore, our results show clearly the effects of environmental factors which effect on adult mosquito density.

DISCUSSION

It was observed during the present study that all the village areas (micro habitat) provide ideal breeding conditions for the *Ar. obturbans*. During the survey it was also observe that common structural trend in all the houses for water storage tanks that buildup under the stair case area where the sunlight penetration is low and also controlled kind of environment was available made the mosquitoes to breed vigorously. Kant *et al.* (1996) observed in their study that aquatic vegetation in larval habitats may also affect the abundance of mosquito larvae by providing shelter and protection, while during survey in the out skits habitats we have also observed similarly that mosquito larva were found more on the peripheral regions having vegetation. It was observed during collection that monsoon ditches and pools created near riverside found filled with rain or sewage water mixed was the preferential site for breeding of *Ar.obturbans*. And also observed that which water is highly condensed with organic matter are the major sites for enormous larvae production of this species. Breeding of mosquites and for disease transmission, rainfall and temperature are considered as the important environmental contributors (Alicia *et al.*, 2000; Joseph *et al*., 2004; Pemola and Jauhari, 2006) and this study results also showed similar effects of climatic variability on mosquito density.

CONCLUSION

Mosquitoes create serious public health issues which are causing huge impacts on the households, health services and ultimately on the economic growth of communities and nations. During the study period we have recorded plenty larval and adult species of *Ar. obturbans* from their breeding and resting sites within the houses and nearby houses. Our results also showed that the larvae/adult density of this species is mainly affected by the rainfall and temperature variability. We strongly believe from the study that the local socio-economic environment of the community have direct relation towards spreading of mosquitoes borne diseases in the area. Therefore, first responsibility of the local people is to regularly keep cleaning of mosquito breeding and resting sites. Government and NGO's should create awareness and educate the people regarding mosquito borne diseases through various programmes. Detection of various mosquito borne diseases and eradication of the mosquitoes should be given first priority among the awareness generation and community development programmes.

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REFERENCES

Alicia BG, Ruben AB, Anibal EC, Susana CC and Nicolas JS. (2000). Atmospheric control of *Aedes aegypti* populations in Buenos Aires (Argentina) and its variability. *International Journal of Biometeorology,* 44(3): 148-156.

Bhatt RM, Sharma RC, Gautam AS, Gupta DK and Srivastava HC. (1991). A quantitative survey of anophelines in six villages of Kheda district, Gujarat. *The Journal of Communicable Diseases*, 23(2): 109-117.

Brightmer MI and Fantato MG. (1998). Human and environmental factors in the increasing incidence of dengue fever: a case study from Venezuela. *Geology Journal,* 44(2): 103-109.

Das MK, Nagpal BN, Arun S and Ansari MA. (2003). Bioecology of anopheles philippinensis in Andaman group of Islands. *Journal of Vector Borne Diseases,* 40(1-2): 43-48.

Douglas EN. (2004). Mosquito-borne Diseases as a Consequence of land use change. *Eco Health*, 1(1): 19-24.

Helge K, Jana P, Susanne E, Efstratios M, Maria P, Walter AM and Hanns MS. (2002). Individual cases of autochthonous malaria in Evros province, northern Greece: entomological aspects. *Parasitology Research*, 89(4): 252-258.

Jagdish K and Jagbir SK. (2003). An inventory of Culicidae diversity in Haryana state. *Journal of Vector Borne Diseases* 40: 112-114.

Joseph K, Kate M, Charles MM, John IG and John CB. (2004). Characterization of potential larval habitats for *Anopheles* mosquitoes in relation to urban land use in Malindi, Kenya. *International Journal of Health Geographics,* 3(9):1-13.

Joshi V, Sharma RC, Singhi M, Himmat S, Sharma K, Sharma Y and Adha S. (2005). Entomological studies on malaria in irrigated and non-irrigated areas of Thar desert, Rajasthan, India. *Journal of Vector Borne Diseases,* 42(1): 25-29.

Patel PM. (2002). Certain studies on the mosquitoes of the Surat city and its environs. Unpublished Ph.D. Thesis, South Gujarat University, Surat-395 007.

Pemola DN and Jauhari RK. (2004). Altitudinal distribution of mosquitoes in mountainous area of Garhwal region: Part-I. *Journal of Vector Borne Diseases*, 41(1-2): 17-26.

Pemola DN and Jauhari RK. (2006). Climate variables and malaria incidence in Dehradun, Uttaranchal, India. *Journal of Vector Borne Diseases,* 43(1): 21-28.

Kant R, Pandey SD and Sharma SK. (1996). Mosquito breeding in Relation to aquatic vegetation and some physico-chemical parameters in rice fields of central Gujarat. *Indian Journal of Malariology*, 33(1): 30-40.

Roy DN and Brown AWA. (1971). Book of Entomology (Medical and Beterinary), 3rd ed. The Banglore Printing and Publishing Co., Ltd., Banglore. 73; 74-78; 99-107; 174-188; 215-235 p

Steven AJ, Philip LL and George FO. (2004). A field test for competitive effects of *Aedes albopictus* on *Aedes aegypti* in South Florida: differences between sites of coexistence and exclusion? *Oecologia*, 139(4): 583-593.

Vyas SM. (2008). Certain studies on mosquitoes of Rajkot city. Ph.D. Thesis, Saurashtra University, Rajkot-360 005.

[WHO] World Health Organization. (1975a). Manual on practical entomology in malaria part – I. WHO division of malaria and other parasitic diseases, World Health Organization, Geneva.

[WHO] World Health Organization. (1975b). Manual on practical Entomology in malaria Part – II. WHO division of Malaria and Other Parasitic Diseases, World Health Organization, Geneva.