International Journal of Advanced Research in Biological Sciences
ISSN : 2348-8069
www.ijarbs.com

Research Article

Dengue Vector: A Major threat to human beıngs

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Abstract

A survey was carried out by entomological experts to monitor aedes belong to family culicidae, order diptera and surveillance in potential risk area for human beings lived in Lahore during 2013. The survey was conducted in pre and post season at union council level in different towns of Lahore. The result revealed that in pre-season scattered distribution of rain splashes resulting low infestation of aedes species was found. However during post season, there was huge spell of monsoon infested area of aedes species were rapidly increasing (4.31%) day by day. The survey showed that 3.98% hot spots of *Aedes* were recorded from outdoors and 5.41% from indoor populated areas. However overall infestation of Aedes was recorded in range 1.60%-9.88%. It was concluded that awareness should be provided to people through electronic media, pamphlets and lectures to overcome this national disaster. However mechanical control gave better results to control mosquito because it was environment friendly, no pesticide residue illumination for human beings and naturally growing population.

Keywords: Entomological Survey, surveillance, Monitoring, distribution, Towns, Aedes species Lahore-Punjab-Pakistan.

Introduction

Dengue fever a silent viral disease spread by Aedes species of mosquito belonging to family culicidae and order diptera. The technical name of dengue vector is *Aedes aegypti* and *Aedes albopictus* also known as Asian Tiger and Black mosquito in some local places of Pakistan. Mosquitoes are poikilo-thermic (cold-blooded), thus their rate of development and other aspects of their physiology are temperature-dependent, as temperature increases; their development time shortens (Anderson 2003). Male species of adult mosquito feed on nectar of plants and helpfull in pollen spreading (Lillies; flowers; ornamental plants and flowers; nearctic boral orchads; Planthera obtusata and Rat ki Rani) however its female sucked blood protein from human beings and animals in ordered to lay eggs and active in a day time. Mosquito eggs survived long periods of time allowing to be easily spread to new localities due to hard egg shell (Juan, 2010). It bites primarily during the day and also active during the first two hours after sun rise and before sunset, but it can bite at night in well lit areas. These female species can also bite dogs along with mammals and suck blood protein. Newly emerged female mosquito suck blood protein from virus carrier patient.

The virus entered in to the mid gut of mosquito; here gram–ve proto-bacteria present that multiply virus rapidly in a short time. These carrier mosquitos become vector for spreading dengue fever in human beings. Aedes species were the most important insect caused arthropod-borne viral disease in South Asia (WHO, 2000). DHF, a vector borne disease of tropical and subtropical human populations occured predominantly in urban areas of Punjab, Sindh, Sarhad and KPK Province of Pakistan. The global increase in urban population of 1.7 million in 1980 was expected to double by 2010 led to an increase in dengue infection in future. Like malaria dengue virus had become a global threat (Pinheiro 1997; Gubler 1998). Control of pre-domestic vector was only the effective preventive measures (surveillance and dewatering, mechanical control) were beneficial. Until an effective, safe and affordable vaccine was available against a vector that deals with epidemics (Grats, 1993). During 2013 dengue viral patients were detected in KPK, 6900 in Sindh and 2800 in Punjab. Aedes spp. preferably thrived in artificial collections of water breeding places like construction buildings, stagnant water, tanks, water coolers and receptacles of rain water collections. Their population fluctuated with environmental conditions (temperature, rainfall and humidity). Dengue infections were encountered after rain splashes resultantly increase in vector population. The optimal temperature for Aedes larval prevalence was 28 ^{o}C developments was high and below 18 ^{o}C the growth got prolonged (Christophers, 1960). Above 36 ^{o}C larval development was not complete (Zeev, 1958); extreme hot and dry weather killed eggs (Gubler, 1988) and rendered adult vectors inactive (Rudolf et al., 1925). Therefore entomological pest survey against dengue vector (Aedes spp.) had been planned at urban area to evaluate the distribution; eradicate vector, abolish breeding sites, control the immature and adults of Aedes species of different towns of Lahore Punjab-Pakistan.

Distribution

Dengue Vactor Risk was continued by urbanization, industrialization and transport development. All these factors contributed to the maintenance and spreading of vector (Gubler et al., 1994). Rapid transport development changed ecology of the coastal regions. Dengue viral activity was reported in Lahore, Rawalpindi, Faisalabad and Karachi. Aedes species were found breeding in natural receptacles (tree hole) but always near human habitation (Rathor 1998). Aedes species associated with a well defined range of immature habitats principally small to large artificial containers (Parker et al., 1983). Discarded automobile tyres found to be an ideal site in the USA (Chambers et al., 1986). The life cycle of Aedes species never completed from egg to adult in water. They are usually fined in Zee's (pots) and other water containers in houses and coastal marine boats, but also occur in rocks and tree holes. The *Aedes aegypti* adult have white banded legs moon like white marks on the front of the thorax spots on the joint of legs (Abdanour 2004).

Materials and Methods

A survey was carried out by the experts of Agriculture Department having experties in Agriculture Entomology to monitor aedes belonging to family culicidae and order diptera and surveillance in high risk area of Lahore during 2013. The survey was conducted in pre and post season at union council level in different towns of Lahore, collected 20 spots randomly selected in each union council per day. The random walk method was used for outdoor and indoor populated areas from which 200 spots were collected randomly in ten towns each day. Larvae and pupae were collected by using pipette or dropper or sucker method. These larvae collected into the universal plastic bottles and ecological information was written in it. Identification of aedes species were recorded by observing 90 degree angle under the lower surface of water, size, thickness of siphen tube and its physiology. After getting hot spots/positive mechanical control was applied by removing water from any pot. The ovitrap consist of earthen pot with round from all sides. The container exterior was coated with a layer of black oil paint. Each ovitrap was filled with approximately 500 ml tap water and a hardboard paddle (20.0 x 4.5 x 0.5 cm) was placed in the water with the rough surface upwards. The paddle served as an oviposition substrate for the female aedes (Lee 1992). A total of 10 ovitraps were placed indoors or outdoors areas in 10 randomly selected schools in each town. Ovitrap surveillance was monitored four times a month or in every week. Sufficient quantity of water was added to ensure the paddle was fully submerged. The hatched larvae were identified and counted on the 3rd day post collection.

Results and Discussion

Figure I showed that 9.88% hot spots were recorded during 2013 significantly less than 2011 (17.05%). In Lahore Cantonment Board 7.26% infested area was recorded compared to 6.23%. In Data Ganj Buksh Town minimum (2.82%) infestation of Aedes was recoded which was to low than (12.33%) during 2011. Similarly Shalimar town showed (5.72%) infested area which was too low than (17.32%). Aziz Bhatti Town showed (6.24%) infestation than (14.07%). Minimum infestation was recorded by Wahga (2.26%); Nishtar (1.6%); Samanabad (3.16%); Allama Iqbal (1.58%); Ravi (2.74%) during 2013 compared with (18.32%); (17.59%); (14.79%); (18.71%) and (20.32%) respectively during 2011. The mean value showed that attack of Aedes mosquito was recorded maximum (15.67%) during 2011 but reduced to (4.44%) during 2013.These results were significantly less than previously recorded data resulting the infection of Dengue Hemorrhage Fever (DHF) was decreased drastically.

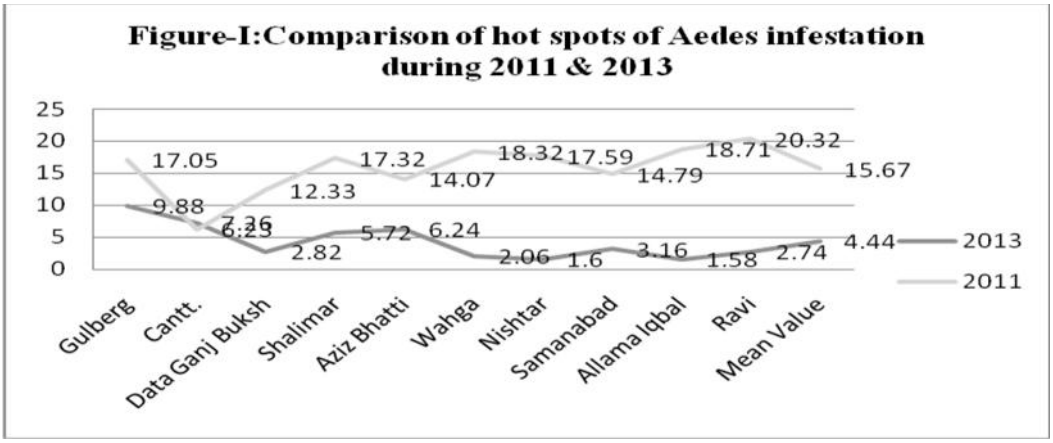
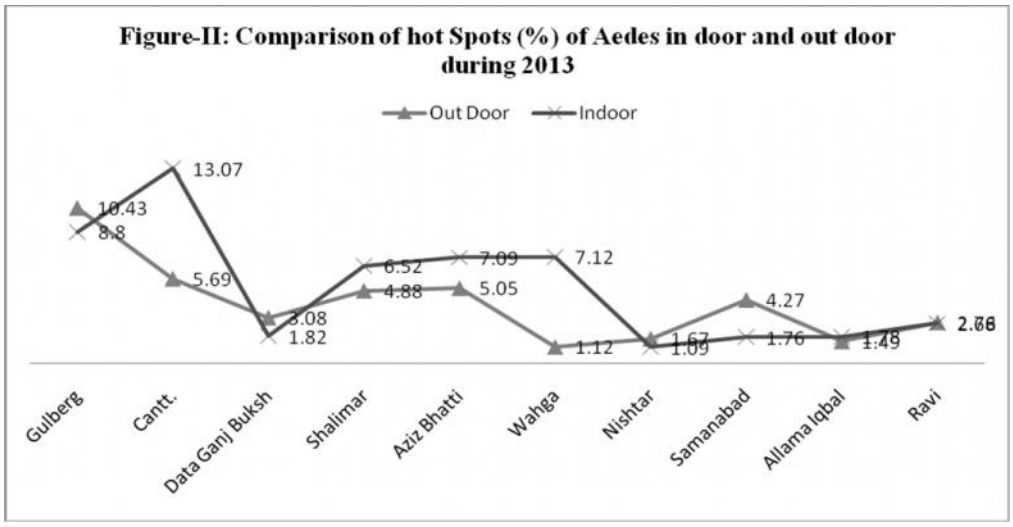


Figure II showed that 10.43% infestation was recorded from outdoor and 8.80% from indoors during 2013 in Gulberg town. In Lahore Cantonment Board and Defense Housing Authority 7.26% spots were monitored in which 5.26% was recorded from outdoors and 13.07% from indoors declared high risk area of Lahore. In Data Ganj Buksh town 2.82% spots were visited in which hot spots were declared 3.08% from outdoor and 1.82% from indoors. In Shalimar town 5.72% spots were visited in which 4.88% infestation was recorded from outdoor and 6.52% from indoors during 2013. In Aziz Bhatti town 6.24% spots were monitored from which 5.05% infestation was recorded from outdoor and 7.09% in indoors. In Wahga town 2.06% area was visited from which 1.20% infestation was recorded from outdoor and 7.12% in indoors during 2013. In Nishtar town 1.60% spots were visited from which 1.67% infestation was recorded from outdoor and 1.09% from indoors during 2013. In Samanabad town 3.16% area was visited from which 4.27% infestation was recorded from outdoor and 1.76% from indoors during 2013. In Allama Iqbal Town 1.58% infestation was recorded, out of which 1.49% infestation was recorded from outdoors and 1.78% from indoors. In Ravi town 2.74% spots were visited from which 2.76% infestation was recorded from outdoor and 2.68% infestation in indoors. Cities were highly populated area of Pakistan found hot spot/infested/positive area (Lahore, Islamabad, Rawalpindi Punjab, Karachi–Sindh and Swat-Khyber Pakhtunkhawa). The study indicated that continuous usage of temephos-50% EC/granules created resistance against larvae of Dengue mosquito resulting efficacy of temephos reduced (Singh et al., 2014). Now a day developed and developing countries were on highly risk to dengue fever (Monath 1994). In 2006 Dengue Hemorrhagic fever outbreak took the epidemiological condition and 4000 people were infected resultantly during 2010 after monsoon season faced the outbreak of DHF in Karachi-Sindh (Rajpot et al., 2010). Ahmad et al., (2009) and Tariq et al., (2010a) reported that whole Karachi Division was positive in their survey, however Karachi division had declared dengue zone of Sindh Province. However during 2011, 21685 cases of dengue patients were registered, out of which 17610 patients were admitted from Lahore area which was too much high compared to 2800 during 2013.



Chemical control of larvae

Larval treatment was most effective for managing this notorious insect because in this stage larvae were localized and restricted to a small space due to the low mobility (Howard 2007).

- Temephos was recommended for controlling larvae of Aedes (Lee et al., 2008). Temephos applied @ 200 ml according to 3 feet volume and depth of water to control larval population **or** 2cc per liter of water **or** 5 gram per 3 feet volume and 3 feet depth of water **or** Temephos should be added in portable containers as 1% (w/w) sand granules to control breeding in stagnant waters (Cheong, 1978) **or** 2 gram temephos should be added per square meter of water (Ali 2013).
- Fenthion 2 % dose 0.55 g per square meter was used upto 15 cm; dose was doubled upto 25 cm and three times upto 35 cm with depth of water.
- Sodium Chloride becomes most effective, environment friendly and economical for controlling newly emerged larvae.

Control of larvae by Sodium chloride solution

Final instar larvae reared in fresh water transferred to sodium chloride solutions of various strengths at 24 ^{o}C showed that mortality increased with rising concentration of Sodium Chloride. On an other experiment the eggs were allowed to hatch in Sodium Chloride solutions, after hatching larvae died within 2 days. At 1.25% solution of Sodium Chloride gave better results to control larvae of aedes species in 4-7 days. At 0.3% increase in initial solution, they died within 72 hours and at 0.4% within 48 hours (Wigglesworth 1993).

Chemical control of adults

- Deltamethrin and diesel applied at the ratio of 1:20 Liter for fogging.
- Deltamethrin used @ 2 liter per 100 L of water for controlling it.
- Adulticides commonly used in mosquito control program were pyrethroids (Ang & Satwant, 2001). Mortality (%) was recorded by formula given by Ali et al., 2013.

Control of larvae by using Predators

Larvae of water living organisms such as Frog, dragonfly, species of fish (Talapi) were used to kill them by feeding.

Symptoms of Dengue virus in human

Classical Dengue fever

It was an acute and severe febrile disease. Fever attended by prostration, chills, intense headache, retro-ocular pain, muscular and joints pain. Nausea, vomiting, sore throat and adenopathy were found. In the classic form (Dengue fever – DF), death was rare, (Marino, 2006)

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Dengue Haemorrhagic Fever

Dengue Hemorrhagic Fever mortality was recorded high in children. The incubation period was 5 to 8 days. *Aedes aegypti*, the most common vector in the Americans, reproduced easily in stagnant waters. The

etiologic agent was RNA-virus genus flavivirus, family Togaviridae, presented different serotypes; immunity elicited by the disease was serotype-specific (Marino, 2006).

Remedy in Homoeopathy

Medicines used frequently in classical dengue fever were Aconitum napellus, Arnica montana, Arsenic album, Belladonna, Bryonia alba, Eupatorium perfoliatum, Ferrum phosphoricum, Gelsemium, Ipecacuanha, Natrum muriaticum, Nux vomica, Pulsatilla and Rhus toxicodendron prescribed on the basis of symptom similarity (Manchanda, 2014). One of these in 30 or 200 potency can be safely taken twice a day for three days.

Prevention of dengue fever

General Measures

1. Personal prophylactic measures

- Mosquito repellents such as creams, liquids, coils, mats should be used.
- Full sleeve shirts and pants with socks should be used.
- Bed nets for sleeping infants and young children should be used to prevent mosquito bite.

2. Preventive Measures

China Self @ two tablets per day and used for three days regularly.

3. Curative Measure

A homeopathic complex composed of Eupatorium perfoliatum, Phosphorus and Crotalus horridus 30cH, given to 20,000 city residents Harydus was used @15 drops three times a day in dangue fever (Marino, 2008). In severe infection fresh and natural juices (apple, lemon) should be used to enhance quantity of platelets in blood.

Conclusion

At the end it is concluded that awareness should be provided to people through electronic media and lectures to overcome this national disaster. Fight against mosquito adults was temporary, unsatisfactory; in adequate and environment polluting caused respiratory diseases in human beings and kill beneficial insects. However mechanical control gave better results because it is environment friendly, no pesticide residue effect for human beings and naturally grown population.

References

Abdanour. 2004. Key identification of Aedes mosquito in Sudan. Med. Ento. Deptt: Khartoum, Sudan.

Ahmad. I, R.M. Tariq, Qadri S. S. 2009. Scouting and Survey of Towns of Karachi city for the presence of dengue vector mosquitoes (*Aedes aegypti* L.). Pak. J. Ento. Karachi. 24(1&2):61-62.

Ali, M. Y. S., Venkatraman A., Sirajudeen, S. A., Vijaya, P., Yogananth, N., Ramachandran, R., Parveen, P. M. K. 2013. Mosquito larvicidal properties of volatile oil from salt marsh mangrove plant of *Sesuvium portulacastrum* against Anopheles stephensi and *Aedes aegypti*. J. Coast. Lif. Med. 1(1):65-70.

Anderson, R.R. and Harrington, L.C., Cornell. 2003. Cooperative extension, 1.

Chambers D. M., L. F. Young, Hill H. S. J. 1986. Backyard mosquito larval habitat availability and use as influenced by census tract determined resident income levels. American, J. Mosq. Cont. Assoc. 2(4):539-544.

Cheong, W.H. 1978. The present status of dengue fever/dengue haemorrhagic fever and its control in West Malaysia. Asia. J. Infecti. Dis. 2: 136–138.

Christophers S. R. 1960. *Aedes aegypti* (L). The yellow fever mosquito, its life history, bionomics and structure, Camb. Uni. Press. Newyork.

Grats, N. G. 1993. Lessons of *Aedes aegypti* control in Thiland Medical and Veterinary Ento. 7:1-10.

Gubler, D. J. and Clark G. G. 1994. Community-based integrated control of *Aedes aegypti*, a brief over view of current programmes. Amer. J. Trop. Med. (50):50-60.

Gubler, D. J. 1988. Dengue the arboviruses, Epidemiology CRC Press. 23(II):223-260.

Gubler, D. J. 1998. Resurgent vector borne disease as a global health problem. Emerg. Infect. Dis. (4):442-450.

Juan, S. 2010. Dengue and the *Aedes aegypti* mosquito. National Center for emerging and zoonotic infection disease. Dengue branch, Canada.

Lee, H.L. 1992. Aedes ovi-trap and larval survey in several suburban communities in Selangor, Malaysia. Mosq. Born. Dis. Bull. 9: 9–15.

Lee, H.L., Chen, C.D., Masri, M.S., Chiang, Y.F., Chooi, K.M. & Benjamin, S. 2008. Impact of larviciding with a *Bacillus thuringiensis* israelensis formulation, Vecto Bac WG, on the dengue mosquito vectors in a dengue endemic site in the state of Selangor, Malaysia. South. Asia. J. Tropi. Medi. Publ. Heal. 39: 601–609.

Manchanda, R. K., 2014. Guidelines for homoeopathic practitioners for clinical management of dengue fever. Central Council for research in Homoeopathy, New Delhi (India) First Edition. pp 01-22.

Marino, R. 2008. Homeopatia em saúde coletiva: contribuição ao estudo de epidemias [Dissertation (MSc)]. São José do Rio Preto: Faculdade de Medicina de São José do Rio Preto.

Monath, T. P. 1994. Dengue: the risk of developed and developing countries, Proc. Nat. Acad. Sci. USA. (91):2395-2400.

Parker, A. G., Giglioli, M. E. C., Mussington, S., Knudsen, A. B. Wards, R. A. and Aaron R. 1983. Rock hole habitates of a fedsol population of Aedes spp. On the island of Anexjilla West Indies. Mosq. New. 43(1):79-81.

Pinheiro, P. F, Corber S. J. 1997. Global situation of dengue and Dengue Hemorrhage Fever and its emergence in the Americas. Worl. Healt. Stat. Q. (50):161-169.

Rajput, M., Tariq and Azmi M. A. 2010. Dengue fever virus vector mosquito (Aedes) prevalence survey report of sindh province by seven different methods and outbreak of dengue in Karachi. Paki. J. Ento. Karach. 25(2):113-116.

Rathor, H. R. 1998. The role of vectors in emerging and re-emerging diseases in the Eastern Mediterranean Region. East. Medit. H. J. 2(1):61-67.

Rudolfs, W. 1925. Relation between temperature, humidity and activity of house mosquitoes. J. New Jers. Ento. Soci. (33):163-169.

Singh, R. K., Mittal, P. K., Kumar, G. and Dhiman, R. C. 2014. Insecticide susceptibility status of *Aedes aegypti* and *Anopheles stephensi* larvae against temephos in Delhi, India. Inter. J. Mosqui. Red., 1(3):69-73.

Tariq, R. M., Ahmad, I. and Qadri S. S. 2010a. Population dynamics and mechanical control of dengue vector mosquito, *Aedes aegypti* and *Aedes unilineatus* in seven towns of Karachi. Pak. J. Ento. Karachi. 25(1):21-26.

Wigglesworth, M.A. 1993. The adaptation of mosquito larvae to salt water. J. Exp. Biol. X(I): 27-37.

World, H. O. 2000. Dengue Hemorrhagic fever weekly epidemiological record. (75):193-196.

Zeev B. M. (1958). The effect of temperature on the growth rate and survival of the immature stages of *Aedes aegypti* (L). Bulle. Ento Res. (49):157-163.