Culex Mosquito: Vector of Filariasis

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Introduction :

Among the various infectious diseases, vector borne diseases are the main burden today and may be expected to represent the highest proportionate disease burden in the near future. Mainly, the insect-transmitted diseases remain a major cause of illness and death worldwide (Borah et al., 2010). Mosquitoes (class-Insecta, order- Diptera) are the most important single group of insects which cause millions of death every year by transmitting various diseases like Dengue, Chikungunya, Yellow Fever, Lymphatic Filariasis, Japanese Encephalitis, Malaria etc. (Barik et.al., 2012). According to World Health Organization, mosquitoes are 'Public Enemy No.1' (WHO, 1996). There are more than 4500 species of mosquitoes distributed throughout the world in 34 genera; but mostly belongs to Aedes, Anopheles and Culex (Ghosh et.al., 2013). Malaria is transmitted by female Anopheles mosquito; Aedes aegypti and some other species mosquito responsible for the transmition of Dengue and Chikungunya while Culex mosquito have been incriminated for the transmission of Lymphatic Filariasis (Yerpude et.al., 2013). These diseases not only cause mortality or morbidity among the human but also cause social, cultural, environmental and economic loss of the society (Ghosh et. al., 2013). They are found throughout the world except in that places which are permanently frozen. In nearly all mosquito species, the female individuals feed on vertebrate blood to obtain their needed protein for the development of their eggs. During their feeding, a complex type of salivary secretion occurs and the fluid is directly injected into the capillaries to enable several life forms such as viruses, protozoa, and nematode worms for the exploitation of mosquitoes as a means of transfer between vertebrate hosts. In almost all cases, within the insect, there is an obligatory phase in which pathogens multiply prodigiously in the salivary glands and can be inoculated into a new host during a later blood meal (Paul, 2001).

Scientific Classification of Culex Mosquito:

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Diptera
Family:	Culicidae
Genus:	Culex

Culex Mosquito Vector:

According to the discovery of Manson, the disease, elephantiasis was caused by a filarial worm and transmitted by mosquitoes of Culex

genus, which was the first demonstration that mosquitoes transmit diseases (Wilke, 2009). Culex quinquefasciatus, the potential vector of bancroftian filariasis is the most widely distributed mosquito in India (Borah et al., 2010).

It is commonly called 'southern house mosquito'. It is medium sized, brown colored, night-time active, opportunistic blood feeder, vector of many pathogens, several of which affect humans.

It is responsible for major public health problem in India with around 31 million microfilaraemics, 23 million cases of symptomatic filariasis, and about 473 million individuals potentially at risk of infection (Borah et al., 2010) (Fig.-1). Map showing Japanese encephalitis endemic districts in different States of India is presented in Fig.-2.

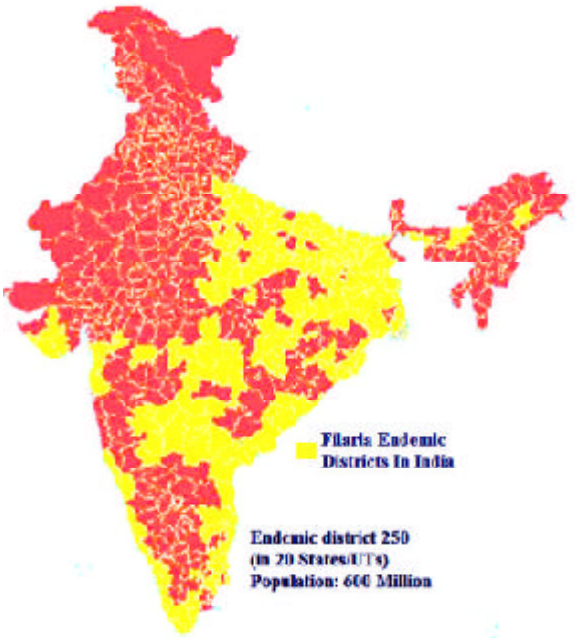

Figure 1: Filaria endemic districts in India (Source: NVBDCP, 2012)

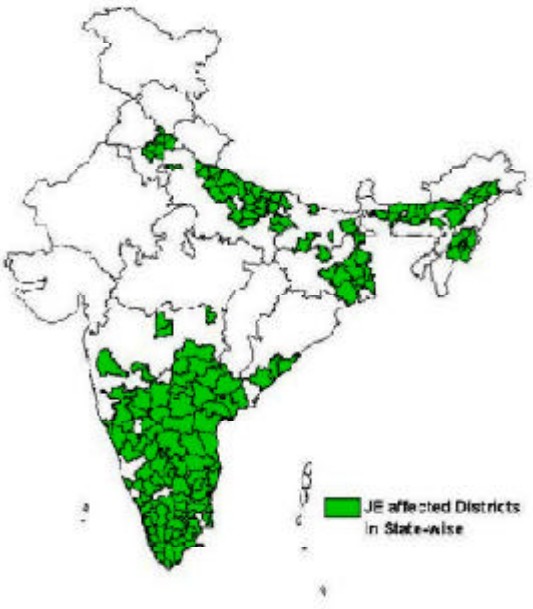

Figure 2: Japanese encephalitis endemic districts in India (Source: NVBDCP, 2012)

Life Cycle of Culex Mosquito Vector:

Culex mosquitoes like other insects also involved different stages like egg-raft, larva, pupa and adult in its life cycle (Fig. 3).

Egg-raft: Culex genus mainly laid their eggs in the form of raft. Each raft may contain 100-200 or more eggs, loosely cemented together. Their egg numbers per egg-raft depend upon the species and the quality and quantity of blood meal taken by them. A single gravid female may lay up to 5 egg rafts in its life time. This normally hatches at the optimum temperature of 250C to 300C within 24 to 30 hours after being oviposited (NVBDCP, 2012).

Larva: After egg hatching, the youngest stage is called first instar larva (L1). There are four larval stages (L1, L2, L3 and L4) each stage having the larval time period of about 24 to 26 hours at optimum temperature and changed by the molting

process. All the instars are voracious eaters, taking anything and everything of microscopic size into the buccal cavity by instant vibration of its feeding brushes. They are mainly bottom feeders but may feed from the surface also. Their larvae show distinctive swimming style, so they are known as "wrigglers". They have a distinctive tube for breathing which extends from the end of their body.

Pupa: The 4th instar at the end of its stage gives rise to a comma shaped pupa. Pupae do not feed but are very active, respiring through its pair of breathing trumpets. The pupal period is approximately 36 hours at 270 C and then they transform into adults.

Adult: Adults are not the strong fliers. Male adult mosquitoes primarily feed on nectar and do not bite humans while the female mosquito after mating requires a blood meal for their ovarian development. Adult mosquitoes of both sexes require carbohydrate foods. When female mosquito bites an infected person she transmits the worm to healthy humans by biting them. They generally feed during the evening and morning. The life span of female and male Culex mosquito is about more than a month and 1 to 2 weeks respectively. The entire cycle from egg to emergence of adult is completed in 10- 14 days.

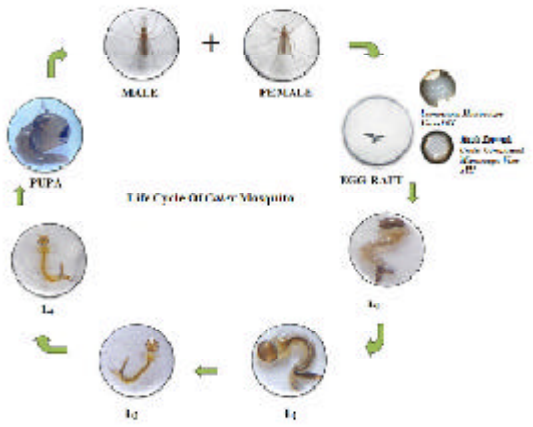

Figure 3: Life cycle of Culex mosquito

Breeding Sites Of Culex Mosquito Vector:

Culex mosquitoes breed in association with human habitations and are the domestic pest mosquitoes. They preferred to breed in polluted waters, such as sewage and sullage water collections including ceass pools, ceass pits drains and septic tanks etc. (Fig. 4). Their egg-raft found on the surface of water in rain barrels, neglected bird baths, swimming pools, clogged rain gutter, tin cans, old tires, car bodies, cisterns, roof gutters and any other containers which hold water. They can also breed in comparatively clean water collections if such types of polluted water collections are absent.

Culex Mosquito Control Strategies:

Since the end of the 1800´s when it had been discovered for the first time that the mosquito vectors (Insecta: Diptera: Culicidae) participate in the transmission of several pathogens to humans, they have been intensely studied. In the 1950's and 60's, many countries organized the official programmes of mosquito vector control by using chemical strategies along with removal of breeding sites and personal protection (Wilke et al., 2009). Mainly, chemotherapy, vaccination, and mosquito vector control have played major roles in reducing transmission of mosquito borne diseases in many parts of the world (Paul, 2001). In the endemically affected countries, their growth reduction is high but the related control methods are not always effective because of their resistance to different groups of chemical insecticides. So, it is needed to develop effective strategies to control mosquito vectors (Barik et al., 2012). In order to control and eliminate mosquitoes in specific habitats under different environmental conditions,

Figure 4: Breeding sites of Culex mosquito

many control strategies are devised (Reynolds and Hellenthal, 2003). These includes: chemical control methods, biological control methods, genetic control methods, personal protection strategies and community awareness.

Conclusion:

In the 21st century's world mosquito vectors remain a major problem due to their disease transmitting nature. Culex mosquito also plays important role in transmitting the disfiguring and disabling disease filariasis. So, adaptation of its effective control strategies is necessary for the community.

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