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Contemporary and Ancient Review of Mosquitoes - A Review

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ABSTRACT

Indian system of medicine plays an important part in health care system all over India. There are numerous allusions to mosquitoes in Indian writings from the Vedic era. The *Atharvaveda* makes special reference of mosquito shape, habitat, many varieties, behaviour, and even their presence throughout the year. The 67 different forms of *Keet* and their genesis were documented by *Acharya Susruta* in *Kalpasthana*, while *Keet Visha* describes five different types of *Mashak* in which *Parvatiya Mashak* is the most hazardous to people. There is also *Mashak* description In *Charaka Samhita* of chapter *Visha Chikitsa.* Numerous mosquito species have been identified in contemporary science. Mosquitoes are the most important group of blood sucking insects causing nuisance diseases to humans and other animals. It follows that our ancestors' seers or philosophers were already aware of this.

Key words: *Atharvaveda, Ayurveda, Mosquitoes, Keet, Vedic Era.*

INTRODUCTION

Mosquitoes are amongst the most disturbing insects which are very hazardous to humanity.

Mosquitoes are known to spread deadly vector borne diseases. There are more than 404 species and subspecies of mosquitoes found in India; common ones belongs to *Anopheles, Culex*, *Mansonides* and *Aedes*. Amongst these *Aedes* is the most dangerous species of the mosquito's causing dengue, chikungunya, zika, yellow fever etc. *Aedes* is a genus of mosquitoes originally found in tropical and subtropical zones of the world. The number of diseases and deaths due to *Aedes aegypti* mosquitoes in India is increasing rapidly every year.

In recent years, Vector- borne diseases account for over 17% of all the infectious diseases. Up to 700 million people are infected and more than a million die each year from mosquito borne illness. Dengue and Chikungunya are the most common diseases related to *Aedes* mosquitoes.[1]

It's interesting to note that although the globe is not new to mosquitoes and the disease malaria, the Vedic people were also aware of it. There is an extensive description of the habitat and behavior of mosquitoes. Malaria's morphology, malaria, and even the parasite within *Atharvaveda*.[2]

Description of Mosquito

Maśaka, the synonym of mosquito word is used in *Sanskrit* classical literature. But, in the *Atharvaveda* both *Makka* and *Maśaka* words for mosquito and *Takman* for fever are mentioned. *Manusmrti* has classified the organisms into four types i.e., *Jarāyuja* (born from the uterus e.g., mammals), *Andaja* (born from an egg e.g., fishes, reptiles, birds), *Svedaja* (born from moisture and heat e.g., Worm sand mosquitoes)

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and *Udvija* (born from vegetable matter). According to this classification, those born due to hot and humid environment like mosquitoes, louse, bug have been kept in *Svedaja* category. According to this classification, those born due to hot and humid environment like mosquitoes, louse, bug have been kept in *Svedaja* category.[3]

स्वेदजं दंशमशकं यूकामक्षिकमत्कुणम् ।

ऊष्मणश्चोपजायन्ते यच्चान्यत्किंचिदीदृशम् ।।

In *Agad Tantra,* bites of poisonous animals such as snakes, *Keet*, spiders, rats, are described under *Jangam Visha*. After this *Acharya Susruta* has told about the origin of *Keet* and its 67 types in the following *Shloka*[4]

सर्पाणांशुक्रविण्मूत्रशवपूत्यण्डसंभवा: |

वाय्वग्नयम्बुप्रकृतय:कीटास्तुविविधा: स्मृताः ||

सर्वदोषाप्रकृतिभिर्युक्तास्तेपरिणामतः |

कीटत्वेऽपिसुघोराःस्युःसर्वएवचतुर्विधाः || (सु.क.8/3-4)

5 types of *Mashak* are described under *Keet Visha*, *Acharya Susruta* has mentioned *Mashak* in *Kalpasthana*. *Mashak* are very hazardous for human health. In which *Parvatiya Mashak* is most dangerous *Mashak* for human being. These *Mashaka* (mosquitoes) are;

मशका:

सामुद्रः,परिमण्डलो,हस्तिमशकः,कृष्णः,पार्वतीयइतिपञ्च;

तैर्दष्टस्यतीव्राकण्डूर्दंशशोफश्च, पार्वतीयस्तुकीटै: प्राणहरैस्तुल्यलक्षण: || (सु.क. 8/36)

After bitten by these, there will be severe itching and swelling at the place of bite. When bitten by insects living in mountains [*Parvatiyamashaka*], symptoms will be similar to causing death.[5]

Charaka Samhita

कण्डूमान्मशकैरीषच्छोथ: स्यान्मन्दवेदनः ।

असाध्यकीटसदृशमसाध्यमशकक्षतम् ॥ (च.चि. 23 /157)

Acharya Charaka has mentioned that Mosquito bite (sting) causes itching, slight oedema and mild pain. The bite of the mosquito of *Asadhya* (incurable) type causes signs and symptoms like those of *Asadhya* variety of *Kitas* (insects).[6]

Ashtang Sangraha

कण्डूमान् मशकैरीषच्छवयथुर्मन्दवेदनः।

असाध्यंकीटसदृशमसाध्यमशकक्षतम् ।। (अ.स.उ.43/17)

Acharaya Vagabhat has mentioned that with the bite of mosquito there will be itching, slight swelling with mild pain. If the symptoms of *Mashaka* are similar to the symptoms of insect bite, then it becomes incurable.[7]

Habitat

Numerous references to mosquitoes can be found in Indian writings from the Vedic era. The *Atharvaveda* (AV) makes specific reference of the habitat, morphology, sorts, behaviour, and even the occurrence of mosquitoes throughout the year. The following mantra in the *Atharvaveda* contains a lengthy examination of the mosquito's habitat:

It is very astonishing that in *Atharvaveda*, there is a detailed discussion about the habitat of the mosquito as mentioned in the following *Mantra*.[8]

ओको अस्य मूज्वन्त ओको अस्य महावृषा:|

यावज्जातस्तक्मंस्तावानसि बल्हिकेषु न्योचर:|| (AV 5.22.5)

Even today, the favourable breeding places of the mosquitoes are where there is excessive rain and too much vegetation. Moreover, mosquitoes come repeatedly to the places where there is heavy rain. Hence, the habitat is similar as is described in *Atharvaveda.*

Mosquito morphology according to ancient view

Modern scientists investigate the detailed description of different body parts of small insects through microscopes and even examine ultra-morphology through Electron Microscope at very high resolutions and then analyze, but the same description is found in the following *Mantras* of *Atharvaveda* written in poetry form thousands centuries ago by the Indian seers.

ये शाला: परि नृत्यन्ति सायं गर्दभनादिनः|

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कुसूला ये कुक्षिला: ककुभा: करुमा: स्रिमा:|

तनोषधे त्वं गन्धेन विषूचीनान् वि नाशय'||

Mosquito behavior

ये सूर्य न तितिक्षन्त आतपन्तममुं दिवः ।

आरायान् बस्तवासिनो दुर्गन्धीं ल्लोहितास्यान् मककान् नाशयामसि'।। (AV 8.6.12)

The behavior of the mosquito is covered in this mantra. In order to avoid the heat from the sun during the day, mosquitoes typically rest in dark areas like homes, barns for livestock, mixed-use buildings, etc. It is also said that they live in leather. Giddiness, yawning, shivering, and other symptoms of a mosquito caused fever can appear in a person. It demonstrates that even in their early days, the Indians of antiquity were well versed in mosquito morphology and behavior.[9]

Mosquito morphology and behavior according to contemporary view

Mosquitoes have one set of wings with distinct scales on the surface, much like genuine flies do. Both their long, thin legs and their long, narrow wings are present. They feature dark grey to black colouring on their delicate, slender bodies, which range in length from 3 to 6 mm. certain species contain distinctive morphological patterns. They frequently hold their front legs outward when at repose. They resemble midges, an ancient family of flies, in appearance. For example, is a midge fly that looks very much like mosquitoes in that they also have slender and dainty bodies of similar colours, though larger in size. They also have only one pair of wings, but without scales on the surface. Another distinct feature to tell the two families of flies apart is the way they hold their first pair of legs; mosquitoes hold them outward, while midges hold them forward. Like all flies, mosquitoes go through four stages in their life cycles: egg, larva, pupa, and adult. The first three stages - egg, larva, and pupa are largely aquatic. Each of the stages typically lasts 5 to 14 days, depending on the species and the ambient temperature, but there are important exceptions.[10]

Life Cycle

The mosquito goes through four separate and distinct stages of its life cycle: Egg, Larva, Pupa, and Adult. Each of these stages can be easily recognized by its special appearance.

Egg: Eggs are laid one at a time or attached together to form "rafts." They float on the surface of the water. In the case of *Culex* the eggs are stuck together in rafts of up to 200. *Anopheles* and *Aedes*, as well as many other genera, do not make egg rafts, but lay their eggs singly. *Culex* and *Anopheles* lay their eggs on the water surface while many *Aedes* lay their eggs on damp soil that will be flooded by water. Most eggs hatch into larvae within 48 hours; others might withstand subzero winters before hatching. Water is a necessary part of their habitat.

Larva: The larva (plural - larvae) lives in the water and comes to the surface to breathe. Larvae shed (molt) their skins four times, growing larger after each molt. Most larvae have siphon tubes for breathing and hang upside down from the water surface. *Anopheles* larvae do not have a siphon and lie parallel to the water surface to get a supply of oxygen through a breathing opening. *Mansonia* larvae attach to plants to obtain their air supply. The larvae feed on microorganisms and organic matter in the water. During the fourth molt the larva changes into a pupa.

Pupa: The pupal stage is a resting, non-feeding stage of development, but pupae are mobile, responding to light changes and moving (tumble) with a flip of their tails towards the bottom or protective areas. This is the time the mosquito changes into an adult. When development is complete, the pupal skin splits and the adult mosquito emerges.

Adult: The newly emerged adult rests on the surface of the water for a short time to allow itself to dry and all its body parts to harden. The wings have to spread out and dry properly before it can fly. Blood feeding and mating does not occur for a couple of days after the adults emerge.

How long each stage lasts depends on both temperature and species characteristics.

Anopheles Mosquitoes

Mosquitoes are important vector of malaria and easily recognized in their resting position, in which the

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proboscis, head, and body are held on a straight line to each other but at an angle to the surface. The spotted colouring on the wings results from coloured scales. Egg laying usually occurs in water containing heavy vegetation. The female deposits her eggs singly on the water surface. *Anopheles* larvae lie parallel to the water surface and breathe through posterior spiracular plates on the abdomen instead of through a tube, as do most other mosquito larvae.[11]

Culex Mosquitoes

The genus Culex is a carrier of viral encephalitis and, in tropical and subtropical climates, of filariasis. It holds its body parallel to the resting surface and its proboscis is bent downward relative to the surface. The wings, with scales on the veins and the margin, are uniform in colour. The tip of the female's abdomen is blunt and has retracted cerci (sensory appendages). Egg laying may occur on almost any body of fresh water, including standing polluted water. The eggs, which float on the water, are joined in masses of 100 or more. The long and slender Culex larvae have breathing tubes that contain hair tufts. They hang head downward at an angle of 45° from the water surface. The life cycle, usually 10 to 14 days, may be longer in cold weather.[12]

Aedes Mosquitoes

The genus *Aedes* carries the pathogens that cause yellow fever, dengue, Zika fever. It holds its body parallel to the surface with the proboscis bent down. The wings are uniformly coloured. *Aedes* may be distinguished from *Culex* by its silver thorax with white markings and posterior spiracular bristles. The tip of the female's abdomen is pointed and has protruding cerci. *Aedes* usually lays eggs in containers, and stored water. The eggs are capable of withstanding long periods of dryness. The short, stout larvae have a breathing tube containing a pair of tufts, and the larvae hang head down at a 45° angle from the water surface. The life cycle may be as short as 10 days or, in cool weather, as long as several months. *A. aegypti*, the important carrier of the dengue yellow fever, chikungunya, and Zika virus, has white bands on its legs and spots on its abdomen and thorax. This domestic species breeds in almost any kind of container, from flower pots to discarded car-tire casings etc.[13]

Control of Mosquitoes

Sunlight

In Atharvaveda, great emphasis is given to sunlight as it is capable to destroy seen and unseen insects and other micro-organism.

उत्पुरस्तात्सूर्य एति विश्वदृष्टो अदृष्टहा ।

दृष्टांश्च घ्नन्नदृष्टांश्च सर्वांश्च प्रमृणन्क्रिमीन् ।। (A.V.5.23.6)

Yajna

Apart from sun light, even Vajña (Vagya) the sacrificial fire is also beneficial in controlling the fever and the insects, which spread diseases.[14]

अग्निस्तवमानमप बाधतामितः सोमो ग्रावा वरुणः पूतदक्षा

वैदिवहिः समिधः शोशुचाना अप द्वेषाख्यमुया भवन्तु ।। (A.V. 45.22.1)

Habitat modification of mosquitoes involves long-term modifications to reduce larval habitats-

- Regional water management projects;
- Installing reliable water supplies for households. This eliminates the need for jars and tanks to store water in individual houses (if supply is reliable) and which can be larval habitats;
- Farming practices that reduce standing water.

CONCLUSION

Hence, it can be said that mosquitoes are as old as Human race. It is apparent that mosquitoes were well-known in ancient India throughout the Vedic era. The scientists of today are well-equipped with tools and other resources that allow them to examine the many components of an insect, but it is possible that our ancestors may have also used cutting-edge technology at the time. As we read through the texts, we discovered that our Vedic seers were knowledgeable about the different species of mosquitoes, their symptoms, and the management mechanisms they

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had developed to protect themselves from both visible and invisible insects.

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