Identification of Mosquitoes, Nature of Diseases and Treatment in Early Sanskrit Literature

Sagan Deep Kaur* and Lakhvir Singh**

(Received 08 December 2016; revised 07 July 2017)

Abstract

The Indian scriptures of Vedic period contain many references to both mosquitoes and various fevers. The Atharvaveda (AV) especially mentions about the habitat, morphology of mosquitoes, their different types, behaviour and even their occurrence in different seasons of the year. In addition to this, the types of malaria i.e tertian, quartan, quotidian, are also described in Atharvaveda, which later on linked with different species of Plasmodium parasite in medical science. Even, the signs and symptoms of malaria fever are very well explained in Atharvaveda, Caraka Samhita (CS) and Susruta Samhita (SS). Atharvaveda also encouraged on the use of various herbs like kuśha, ajaśṛṅgi, guggulu, pīḷā, nalaḍi, auksyandhī, pramandana as preventive measures for painful bite of the mosquitoes. Thus, it is clear that our ancient seers or philosophers were already well aware of the harmful potential of mosquitoes and different fevers caused by these insects. Hence, they suggested different control measures for their eradication.

Key words: Atharvaveda, Behaviour, Control, Habitat, Morphology, Mosquitoes (makka, maśaka), Takman (fever)

1. INTRODUCTION

Mosquitoes are small, two winged insects belonging to the family Culicidae, one of the primitive families of order Diptera. There are about 112 genera and 3555 species of mosquitoes known at present throughout the world (Harbach, 2017). Out of these about 340 species of mosquitoes occur in India (WRBU, 2017). The family Culicidae is divided into 3 sub families viz., Anophelinae, Toxorynchitinae and Culicinae (Knight and Stone, 1977). Mosquitoes of tribe Anophelini of sub family Anophelinae are commonly spoken as ‘malarial mosquitoes’. They resemble other mosquitoes in their chief characters, but generally recognized by their spotted wings and their attitude when at rest.

Malaria is caused by four species of parasites of genus Plasmodium and transmitted to people by the bite of an infected female mosquito of genus Anopheles. In India, there are about 58 species of Anopheles of which seven species viz., Anopheles culicifacies, An. baimaii, An. fluviatilis, An. stephensi, An. minimus, An. philippinensis and An. sundaicus are major vectors of malaria (Tyagi, Munirathinam and Venkatesh, 2015). Common symptoms of malaria include fever, shivering, headache, and pains in the joints while cerebral malaria caused by P. falciparum is often lethal. As far as control of malaria in India is concerned, indoor spraying of residual insecticides in the rural areas and anti larval operations in the urban areas have been the major means. Owing to the development of resistance...
to DDT, other insecticides like HCH, malathion, synthetic pyrethroids have also been employed to control malaria. But, malaria is still a great problem because of insecticide resistance developed by malaria vectors and drug resistance by malarial parasites, rapid urbanization, climate change, increased tourism. In order to address these challenges, WHO has recently developed a national strategy for malaria elimination “National Framework for Malaria Elimination in India 2016–2030.”

Interestingly, mosquitoes and disease malaria are not new to the world but, were also known to the Vedic people. There is a detailed description about mosquito behaviour, habitat, morphology, malaria fever and even of the parasite in Ātharvaveda (Satvalekar, 1958; Whitney, 1971). The Ātharvaveda has its own importance as other three Vedas- Ṛgveda, Yajurveda and Sāmaveda are highly spiritual related to God, mokṣa etc. Ātharvaveda is related to our day to day life. Therefore, the subject matter of this Veda is very unique, as it deals with different kinds of diseases and their cure, medicinal plants, animals especially birds, insects, reptiles and their effect on human, duties of a king, destruction of enemies, science of agriculture, architecture, marriage, society, environment and gratitude towards mother earth etc. Even for the control of adult mosquitoes and their immature stages, the use of various herbs like kuṣṭha, ajaśṛṅgi, guggulu, pílū, naladi, aukṣgandhi, pramandani having strong fragrance is suggested, which also act as repellents for these blood sucking mosquitoes.

2. DESCRIPTION OF MOSQUITO

Maśaka, the synonym of mosquito word is used in Sanskrit classical literature (Bhatt, 2004; Hitopadesha 1.81). But, in the Ātharvaveda (Satvalekar, 1958; Whitney, 1971), both makka (AV 8.6.12) and maśaka (AV7.58.3) words for mosquito and takman (AV 5.22.3) for fever are mentioned. Manusmṛti (500-400 BCE) (Bhatt, 2001) has classified the organisms into four types i.e., jayāyujja (born from the uterus eg. mammals), aṇḍaja (born from an egg eg. fishes reptiles, birds), svedaja (born from moisture and heat eg. worms and mosquitoes) 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-

‘स्वेदज देशाम्यावं यूकामक्षिकमत्त्वम्।
उष्णानथोपायते वेच्छायलक्षिकीर्देषम्।’

(Manusmṛti 1.45)

The Āyurvedācārya Suśruta (400-300 BCE) (Srikantha, 2016) mentioned five species of mosquitoes viz; sea-born (coastal), global (worldwide), the huge type, black in colour and the mountainous.

‘मशाकः-समुद्र:, परिसंधित:, हरितसोभक:, कृष्ण:, पार्वतीयः स्त्रियां।’

(SS, kalpa, 36)

The bite of the mountainous species (pārvaṭīya) is stated to bear the same characteristics as that of deadly insects.

‘पार्वतीयस्तु कौटेष्: प्रायंत हैसुत्तुलक्ष्णः।’

(SS, kalpa, 36)

2.1 Habitat

It is very astonishing that in Ātharvaveda (Satvalekar, 1958; Whitney, 1971), there is a detailed discussion about the habitat of the mosquito as mentioned in the following mantra -

‘अको अस्य मूर्त्तवं अको अस्य महावृषाः।
याक्षािजस्तक्षमतत्तवानसि वर्धकेशु न्योऽचरः।’

(AV 5.22.5)

The home (अको अस्य) of mosquito is, where there is too much grass (मूर्त्तवं:) and too much rain (महावृषाः:) as long as you are born (याक्षाि:) Oh fever (न्योऽचरः:) you are seen in balhikas (तावनिः वर्धकेशु गोऽचरः:)
Other favourable habitat of the mosquito is dirty and unhygienic places and the people, who are living in unhygienic conditions (दासों निष्टक्षोभिन्न्च. AV 5.22.6), (शूद्रामिश्र प्रफृव्य तां तत्कन्नीव धूनिह AV 5.22.7), (‘गच्छामुमरण जन्म’ AV 5.22.12). According to Atharvaveda, mosquitoes do not like clean and healthy environment (अन्याख्यात्रेन न रमये AV 5.22.9)

Even today, the favorable 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 (पुनरेतु महावरणं AV 5.22.4). Hence, the habitat is similar as is described in Atharvaveda.

2.2 Mosquito Morphology and Behaviour

In Atharvaveda (Satvalekar, 1958; Whitney, 1971), the detailed description of practical and theoretical aspect of modern science is described in such an interesting way that it looks as a book of present age. In this Veda, there is a clear cut description of mosquito along with other insects. 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 शालाः पार नूत्यत्स साव गर्भभालिनः।
कुसुमा ये कुशिला: ककुभा: कर्मा: सिमा:।
तानोपधे लः गनने बिषृवीनान् बि नासय।’

(अव्य 8.6.10)

That is, mosquitoes, who (यें) dance around the dwellings in the evening, (साव शालाः) (which we call as swarming for mating in scientific language) making donkey like noises (गर्भभालिनः), having needle like mouth parts, (कुसुमा) big abdomens (कुशिला:) whose body is curved or zigzag or uneven.

(ककुभा:), who make unpleasant sound (कर्मा:) and who spread diseases (सिमा:).
O herb! with your smell, you do make them disappear and scatter these demons.
(तानोपधे लः गननेव बिषृवीनान् बि नासय)

In this above cited mantra, there is a description of mouth parts, especially needle like proboscis (कुसुमा). This is exactly same as we use in scientific terminology, the needle like mouth parts. This needle has four parts—labrum, mandibles, maxillae and hypopharynx (Figs. 1-4). All these four parts have specific functions, like labrum has sensilla, which give indication about the site of feeding, mandibles and maxillae have many teeth, which help to cut the skin during
feeding while, with the help of hypopharynx, the blood is sucked through the salivary canal (Sagandeep et al, 2003). It is also referred as bloody mouth (lohitasyam) in one of the mantra.

In the above cited mantra, almost all the characteristics, mentioned in the earlier mantra, are present. But, here the word ‘shining’ (कुरूर्फ़ा:) is worth seeing as it indicates towards a genus called Aedes in scientific literature. This genus is Jet black having silvery white shining patches all over the body.

‘ये सूर्ये न तितिक्षन आत्यत्तममु दिखि:।
आराधयन् वस्त्रवासिनो दुर्गम्भीर्न ललोहिष्ठास्यान्न मकन्तन्
नाशयमिः’।

(AV 8.6.12)

That is, those who can’t tolerate the solar heat, (ये सूर्ये न तितिक्षन आत्यत्तममु दिखि:) who make people lethargic, (आराधयन्) who live in leather, (वस्त्रवासिनो:) who spread smell, (दुर्गम्भीर्न) and are bloody faced (ललोहिष्ठास्यान्न), we should make these mosquitoes disappear from here. (मकन्तन्
नाशयमिः)

In this mantra, the behavior of the mosquito is discussed. During the day time, usually mosquitoes rests in the hidden places, like human dwellings, cattle sheds, mixed dwellings etc as they cannot face the heat produced by sunlight. Further, it is said that they also live in leather (वस्त्रवासिनो:) (Genus Aedes prefers to breed in tyres). Due to the fever caused by mosquito a person can develop giddiness, yawning, shivering etc. It shows that the ancient Indians were very familiar with mosquito morphology and behavior even during the early days.

3. ROLE OF MOSQUITO IN MALARIA TRANSMISSION

There are many species of mosquitoes, which are responsible for different diseases like Filariasis, Elephantiasis, Japanese Encephalitis, Malaria, Dengue, Chikungunya. Out of these, the symptoms of Malaria are clearly mentioned in Atharvaveda. The symptoms described in Atharvaveda, are almost similar to the now-a-day’s fever named malaria. The scriptures of
ancient period, *Caraka Samhitā* (600-500 BCE) (Sharma, 2014) and *Suśruta Samhitā* (400-300 BCE) (Srikantha, 2016) have mentioned malaria as the “king of diseases”.

```
रोगान्तः सर्वभूतान्नातमकद्वाराणि।
सर्वविविधानां राजस प्रकृति।
```

*CS, Cikitsā 4.345*

```
‘स रोगानीकरणं स्वस्त।’

(SS, Uttara 39.8)

‘सर्वाविष्कारणार्गं राजस प्रकृति।’

(Ibid. 39.10)
```

These books also refer to diseases, where fever is the main symptom.

### 3.1 Classification of Malaria

Malaria is caused by different species of *Plasmodium* parasite. This parasite is transmitted through the bite of *Anopheles* mosquitoes. This parasite is too small and it can be seen only through microscope. The scientists have accepted four species of *Plasmodium* as: 1. *Plasmodium vivax*, 2. *Plasmodium ovale*, 3. *Plasmodium malariae* and 4. *Plasmodium falciparum*.

*Plasmodium vivax* and *Plasmodium ovale* cause tertian malaria (the fever, which occurs third day i.e. after 48 hours), *Plasmodium malariae* causes quartan malaria (the fever, which occurs after 72 hours) and *Plasmodium falciparum* produces quotidian malaria (fever, which comes every day). But, if *Atharvaveda* is studied according to the modern medical science, then we cannot escape from intelligence of our forefathers—

```
तममानं शीतं हरं ग्रैम्यं नाशत वायुवक्तम।
```

*AV 5.22.13*

That is, the fever (तमः) of the third day, tertian (तृतीयकम्), of two successive days, quartan (बिरतीयम्), the constant (सदनिम्), the autumnal (शारदम्), the cold (शीतः), the hot (रूप्यः), that of the hot season (ग्रैम्य) and that of the rainy season (वायुवक्तम) make it to do disappear.

In another mantra also there is a prayer to protect ourselves from this tertian, quartan and quotidian fever.

```
‘नमः शीताय तदानं नामी रूपाय शारदैं कृणाम।
यो अन्येकुण्डवधुर्ध्यति तृतीयकम् नमो अस्तु तदम्।’
```

*AV 1.25.4*

The Rṣi pays homage to the cold fever (शीताय तस्मानं), to the fierce heat (रूपाय शारदैं) like fever, to the one that befalls on every other day (अन्येकुण्डः), that returns for two successive days (रधुर्ध्यति) and that comes on third day (तृतीयकम्) fever (तस्मानं).

Acārya Caraka (Sharma, 2014), also classified malaria according to the periodicity of attack of fever i.e. tertian (तृतीयकम्), quartan (बिरतीयम्) and quotidian fever (सदनिम्).

```
अपि शीते वा प्रथम वीजं कालं च रोग्यति।
अपि शीते च धातुं रोगं कालं च कृणाति।
स वृष्टिः च बलकलं च प्रायं दोपसतृतीयकम्।
चतुर्थीं च कृणुः प्रत्येकबलाः।
कृणात वेंग गतवलं वेंग वेंग शारदीयाम।
पुनश्रवः वेंग कालं ज्यापितं नं मलं।’
```

*CS, Cikitsā 3.68-70*

Here, he compares the phenomenon to the seed, sown in the ground, which lies dormant in the soil for a while and grows up in favorable time. In the same way *doṣas* stay in *dhātus* and get vitiated in opportune time, when the immunity of a person becomes low. When they grow up, they invade the whole body and not being counteracted by antibodies (प्रत्यावर्त, चतुर्थकम्), they cause fever. The *doṣas* having attained exacerbation and timely strength due to weakening of counteracting factor gives rise to the tertian (तृतीयकम्) as well as quartan (बिरतीयम्) fever. When the force of these invading elements is exhausted, they return to their original habitat and again begin to grow up.

### 3.2 Symptoms of Malaria

In the following mantra, the symptoms of the fever are described—
4. CONTROL OF MOSQUITOES

4.1 Sunlight

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

\[ AV 5.22.10 \]

That you being cold (यल्ल शीतोश्यो रूपः), then hot (तपः), you cause trembling together with cough (सोमो ग्राहा वरणः पूलत्तः वंदिबौहि समिधः शोषुपळणाः) do make them away from here the organisms causing diseases (अमुया ट्वेकसि अप भवन्तः).

Similar kind of symptoms are also described in another mantra (AV 5.22.2).

4.2 Yajña

Apart from sun light, even \( \text{yajña} \) (yagya) the sacrificial fire is also beneficial in controlling the fever and the insects, which spread diseases.

\[ AV 5.22.1 \]

The Rśi prayers – let Agni drive the fever away from here (अर्नस्त्यक्षणमय बाधतामिति सोमो ग्राहा वरणः पूलत्तः वंदिबौहि समिधः शोषुपळणाः अप द्वेक्यमुय्युछ भवन्तः) let Soma (Intoxicating juice from a plant of unknown identity) Grava (the pressing-stone), Varuṇa of purified dexterity, the sacrificial hearth, sacrificial grass, the brightly gleaming fuel (सोमो ग्राहा वरणः पूलत्तः वंदिबौहि समिधः शोषुपळणाः) do make them away from here the organisms causing diseases (अमुया ट्वेकसि अप भवन्तः).

4.5 Use of Herbs

There are also references regarding the use of odorous or fumigating medications used to destroy worms and insects. Even to repel them, fumigation by burning of some pungent smelling substances is also recommended. Various herbs like ajaśṛṅgi, guggulu, piḷū, naladi, aukṣagandhi, pramandani are also mentioned to control the mosquitoes in the following mantras-

\[ AV 4.37.2-3 \]

Oh ajaśṛṅgi (अ ज्ञूःर्णि) (the medicine)! through you, we do make away (ल्यो चात्यामहें) the apsarases, (who spread in water), the gandharvas, (singing insects), (अप्सरः: गंधरवः) drive these demons and make them all disappear by your (strong) smell (गंधरवं सर्वायुः रक्ष: आत्मा: गण्डहरवः) Let the water dwelling insects (अप्सरसः) go to the stream full of water (अप्सरसाः तर्क अवश्वसं नदी यान्तः), guggulu (गुगुलुः), piḷa (पिला), naladi (नलादी), aukṣagandhi (औक्षगंधि), pramandini (प्रमन्दिनी) these are five herbs (medicine), know these (प्रिुपित्या अम्मुतः) and there for (तत्) Oh apsarases! (Water living insects) do go away from here (परा हृतः).

There is also a mention of water dwelling insects in the above reference. It may be a indication towards immature stages of mosquito (i.e egg, larva, pupa), which breeds in the water. Even today, great emphasis is being paid to search for effective larvicides so that these harmful
mosquitoes can be killed before emerging into adults.

To control the fever, another herb (medicinal plant) is kuṣṭha, which is very much appreciated in Atharvaveda:

\[\text{Oh kuṣṭha effacer (नाशन) of fever (तब्यन)}!\text{ that you born on the mountains} \text{(तः गिरिया अजात्याः)}\text{ and strongest of all medicinal plants (वीरमाण बलवताम:), destroying the fever you come here from there (the mountains) (तब्यन नाशन् इति: आ इति).}\]

In this mantra the Rṣi addresses to the kuṣṭha to destroy takman. Meanwhile, in another mantra, it is clearly mentioned that kuṣṭha is also very beneficial in eradicating malaria fever:

\[\text{‘शैवलोक तृतीयं स्वन्दर्त्येश्च हाययं:} \text{तब्यन्य विरुध्धाविरुध्धारुपिः परा सुखं\'.}\]

\[\text{AV 19.39.10}\]

The fever (तब्यन्य) which creates head-pain, (शैवलोकं), the tertian (तृतीयकम्)) which is constant (सत्त्विः) and which is hibernal (वर्षश नाशन्:) Oh (kuṣṭha medicine) capable or powerful in every direction! do impel away fever downward (अथालङ्क परा सुख)\]

This herb can make the bite of mosquito effect less ‘तुष्ट्यविवर्धिनां अर्थस्य मश्चक्ष्यास्यं विषं निहर्यासमिः’ (AV 7.56.3), that is why it is called as effacer of mosquitoes ‘मशक्ष्यमनी’ (AV 7.56.2). This herb is also useful for the treatment of snake and scorpion bite, (AV 7.56.1, and 7.56.5)

### 4.6 Vegetarian Diet and Self Control

To prevent malaria, the Atharvaveda (Satvalekar, 1958; Whitney, 1971) strongly advocates for vegetarian diet –

\[\text{‘शक्मभरस्य मूर्षिधा’}\]

\[\text{AV 5.22.4}\]

It means that it (malaria fever) can be killed by the fist of a vegetarian person.

It indicates that a vegetarian life style is more beneficial even today to lead a disease free and healthy life in comparison to a non-vegetarian one. Doctors also suggest that vegetarian food provides more immunity to a person as compared to non-vegetarian diet. Apart from this, leading a self controlled life is another way to escape from this disease-

\[\text{‘वशी समुद्रकासि न:’}\]

\[\text{AV 5.22.9}\]

That is, who has self control and takes precautions (regarding eating habits and routine exercise) the malaria does not harm him. It remains away from such person and he enjoys his blissful life.

### 5. Conclusion

Hence, it can be said that mosquitoes are as old as Human race. It is obvious, therefore, that malaria as a disease and its association with the mosquito were well known as early as the Vedic age in ancient India. The scientists of today are well equipped with instruments and other facilities, through which, they analyze the different body parts of an insect but, our forefathers might have also been laced with ultra modern technique of their times, this possibly cannot be ruled out. While going through the manuscripts, we found that our Vedic seers were familiar with the types of malaria, its symptoms and also invented control measures to save themselves from the visible and non visible insects. Today, though we find various commercial products and other sprayers in the market to prevent them, but these are non effective and sometime even dangerous for human health. But the control measures suggested in Atharvaveda such as sun light, fire, use of herbal plants like kuṣṭha, aśvagandha, guggulu, ajaśṛṇgi, pīlā, pramandani and are quite safe and
environment friendly. It is also worthy to mention that in Sanskrit dictionaries *maśakahari* and *maśahari* words have been given as synonyms of ‘mosquito net’.

**BIBLIOGRAPHY**

Bhatt, Rameshwar (tr) *Hitopadesha*, Chaukhambha Sanskrit Pratishthtan Delhi, 2004

Bhatt, Rameshwar (tr) *Manusmiriti*, Chaukhambha Sanskrit Pratishthtan Delhi, 2001


Satvalekar, Shripad Damodar (ed and tr.). *Atharvaveda*, Swadhaye Mandal, Pardi, 1958

Sharma, Priyavrat (ed. & tr.). *Caraka Samhitā*, Chaukhambha Orientalia, Varanasi, 2014


