Reviews and reports

An attempt to illustrate the malaria situation in Arabia at the time of the Prophet Muhammad ﷺ

Mohyeddin Ahmad Farid[1]

Introduction

Mecca, the birthplace of the Prophet Muhammad, was a famous trading centre and meeting place of caravans arriving from Yemen (within the Abyssinian kingdom at that time), the hinterland of Arabia, and famous towns in the Persian and Roman Empires such as Damascus, Gaza, Basra and Al-Hira. These visitors from many lands must have brought with them some knowledge about the clinical and environmental aspects of malaria as known then in those parts of the world. Moreover, as the ancient Arabs traded mostly in spices, including medicinal herbs, they must have acquired extensive knowledge of the uses of these herbs in treating various diseases.

The intermittent nature of malarial fevers and their association with anaemia and enlargement of the spleen were observed by Hippocrates (460–377 BC) [*1*] as well as by the ancient people of the Old World. These people, including the Arabs, observing the circumstantial epidemiological features of malaria, attempted to minimize the risk by avoiding marshy areas, where the disease spreads, and by drainage of stagnant water. The ancient Arabs recognized the unhealthy environment of certain oases with marshy areas and gave the names of these oases to the fevers emanating from them, e.g. Yathrib fever (Yathrib was the original name of Medina). The fear of oasis fevers might have been a factor in enhancing nomadism in the Arabian peninsula. In many instances, the ancient Arabs referred to these fevers according to the symptoms observed, e.g. *al-ra'asha*, *al-naffadah* and *al-zafzafah* (the fever that makes one shake or tremble); *al-dikk* (hectic fever); *al-safrawiyyah* (that which makes the skin yellow); *al-sawdawiyyah* (that which makes the urine black); *al-mughshiyyah* (that which makes one unconscious). Some names were given to these fevers in relation to their intermittent nature such as: *al-rib'* (repeated every four days counting the first day as day number one); *al-ghibb* (repeated every third day); and *shatr al-ghibb* (every 24–36 hours). When the malarial fever reached epidemic dimensions (associated with deaths as happens with falciparum malaria), the fever was known as the fever of pestilence (*humma al-waba'*).

The ancient Arabs recognized the association of malarial fever with tenderness and enlargement of the spleen (included in the diseases grouped under the Arabic name *that al-janb*). In order to alleviate the pains and increase the chances of survival, particularly among children, they used to cauterize the skin over the spleen area—a practice that continued in the Arabian peninsula until recently.

[1]*Former Chief, Programme and Planning, Division of Malaria Eradication, World Health Organization, Geneva, Switzerland.*

History of malaria in Mecca (570–621 AD)

The Prophet Muhammad was born in the year 570 AD. This year was known as the year of the elephant to commemorate the defeat of the Abyssinian Viceroy Abraha, who had come from Yemen and attempted, with the use of elephants, to invade Mecca and destroy the Ka'aba shrine in order to force the Arabs to make their annual gatherings and trade transactions near his newly established temple in San'a in Yemen. This defeat was recorded in the Quran as follows:

> *Art thou not aware of how thy Sustainer dealt with the Army of the Elephant? Did He not utterly confound their artful planning? Thus He let loose upon them great swarms of flying creatures, which smote them with stone-hard blows of chastisements preordained, and caused them to become like field of grain that has been eaten down to stubble*
>
> (Sura 105, *The Elephant*) [2]

Abraha camped in a place called Al-Mughammas which in Arabic refers to a place where one gets immersed (in water). The traditional interpretation indicates that a large number of seabirds or bats came and flung stones of baked clay on Abraha's army which precipitated a destructive pestilence which incapacitated the army. Abraha himself was taken sick to San'a where he died (as mentioned by Ibn Kathir and others [3]). According to Ibn Kathir, the birds came at night as mentioned by reliable sources. The word *tayr* in Arabic meaning birds or flying creatures is still used in rural areas in Gizan Province in Saudi Arabia, as well as in some rural areas of Egypt, to refer to flying insects such as mosquitos or flies. One can surmise that these "nocturnal birds" could be malaria-transmitting mosquitos that could cause explosive epidemics, such as *Anopheles gambiae*, which is still the main vector in the south-western area of Saudi Arabia. This species is notorious for devastating malaria epidemics such as the one that occurred in southern Egypt during the Second World War and killed about 180 000 people [4]. As to the stones of baked clay, these may refer to malaria parasites symbolized in baked clay from which all living things were created—even man as a biological entity was created from baked clay as stated in the Quran. The Arabs of Mecca were spared the epidemic which afflicted Abraha and his army as they had fled beforehand to the surrounding mountains and thus could not see the nocturnal birds or the stones of baked clay. Earlier in the year of Abraha's invasion, the famous Ma'arib Dam in Yemen was destroyed by overflooding due to heavy rains. This must have affected the whole region including the Mughammas area near Mecca and allowed extensive breeding of the malaria vector.

The insalubrious environment of Mecca, known then as *wakham Makkah*, was associated with malaria only in years of heavy rainfall. It was a known fact at that time that this climate of Mecca was responsible for the very high mortality among young children, possibly mostly due to bacterial and viral infections and occasionally due to malaria epidemics. The three sons of the Prophet by his wife Khadijah died in Mecca at a very young age. It was the custom of the rich people of Mecca to hire wet nurses from the tribes living in the malaria-free and salubrious higher plateau who would breast-feed the infants until they reached a stronger age. Halima, a wet nurse, seeing that all the infants of the rich were taken by others, did not want to return empty-handed and agreed to have Muhammad, and thus she was immortalized in the

history of Islam. She took care of him until he reached the age of five or six years. After returning to his mother, Aminah, she took him to Yathrib, notorious for its Yathrib fever, to visit her family. While returning to Mecca, accompanied only by a woman attendant, the mother died [5]. Given that the Prophet's father also died in Yathrib six years earlier at a comparatively young age, after returning from a trading expedition in Gaza, one may surmise that malaria might have been the cause of the early deaths of the Prophet's parents. In addition, three of the four daughters of the Prophet died in Yathrib a few years after marriage, as well as his three-year-old son. Could these premature deaths be attributed to Yathrib fever also?

History of malaria in Medina (622–632 AD)

The migration of the Prophet to Medina (formerly Yathrib) took place in September 622 AD, a month falling within the malaria transmission season of this city. Prior to his migration, 70 of his followers went to Medina to arrange for his arrival. When he arrived with his closest friend Abu Bakr, he found most of his followers confined to bed and unable to attend the communal prayers in the improvised mosque built by the Prophet upon arrival. Concerned that his disciples would die of the fever, the Prophet prayed for their speedy recovery and was quoted as praying to God, "O God, would Thou lift this pestilence that has afflicted us. O God, fulfil to my companions their immigration and do not let them trace back their steps" [6]. The narrative goes on to say that one night he dreamt of a strong man holding the wrist of a tiny woman clothed in black and the man said to the Prophet, "O Prophet, this woman is the cause of the fever—just order me what to do with her". The Prophet told him to take her to Khumm and leave her there; Khumm was a swampy foothill area between Mecca and Medina which the caravans used to avoid because of its insalubrity. The Prophet was cheered by this dream and, when visiting his sick disciples, he gave the good news that they would soon recover, which they did. This dream is interesting as the tiny woman in black could symbolize the female *A. gambiae* which is responsible for causing explosive malaria epidemics.

Just after the arrival of the Prophet in Medina, Abu Bakr and Bilal (the Prophet's caller to prayer) succumbed to Yathrib fever and were badly affected by it. When Aisha (the Prophet's wife and the daughter of Abu Bakr) told the Prophet about their suffering and hallucinations, he prayed for their speedy recovery and was quoted as saying "May God make us love Medina as we loved Mecca. May God bless its crops, and make it salubrious for us and transfer its fever to Al-Juhfah". Al-Juhfah was an uninhabited area of ruins on the road between Medina and Syria. In connection with the malaria epidemic affecting the emigrants, Aisha stated, "When we arrived in Medina, it was the most pestilential place on earth, and its valley (*but'han*) was *najla* (meaning quite wide with oozing water)" [7]. Her reference to the wide river bed with oozing and stagnant pools in association with the epidemic is indicative of her knowledge of the cause of the epidemic. This observation may also be indicative of the vector responsible for the epidemic, as it is known that river beds with sandy bottoms and stagnant pools are the preferred places for *A. gambiae* breeding.

The insalubrity of Medina during the life of the Prophet can be seen from the story of the nomads who were converted to Islam and came to settle in Medina where

they became sick (with distended abdomens, weakness and anaemia). They complained to the Prophet about their condition and he advised them to drink the milk and urine of the female camels grazing outside Medina. The story goes on to say that they were cured. It is stated by Ibn Al-Kayyim that the best milk and urine was obtained from female camels that grazed on artemisia (*al-sheeh*), chrysanthemum and camomile [*8*]. The Prophet used to say, in connection with Medina's insalubrity, "Medina negates or effaces its impurities as the melting furnace purifies the raw iron". Some commentators believed that this saying may refer to the existence of a cure for Yathrib fever in the milk and urine of camels that grazed around Medina [*9*]. It is interesting to note that almost 14 centuries after the Prophet, the Chinese have recently developed an antimalarial drug extracted from artemisia, and are using it instead of the orthodox drugs.

Another anecdote about the Prophet stated that when he was visiting Umm Al-Mossayeb, he found her shaking in bed, and asked her, "Why do you shake so much?" She said "It is the fever, God curse it!" He advised her not to curse the fever, as it purified the body, as the melting furnace purifies the iron ore [*10*]. This reminds one of the use of induced malaria as a therapeutic agent against tabes dorsalis, neurosyphilis, optic atrophy, interstitial keratitis and other conditions, which was still being practised up to the latter part of the 19th century [*11*].

When the emigrants were permitted to perform their first pilgrimage to the Ka'aba in Mecca, still held by the Prophet's opponents, the latter noticed the deteriorating health of Muhammad's followers. The Prophet overheard them saying, "Yathrib fever did exhaust them". Upon hearing this, he advised his followers to hold themselves straight and jog some stretches when circling the Ka'aba so that their opponents would believe that they were still strong and would do well if confronted in battle. This jogging (called *al-ramal*), regarded as a strategic device at that time, is still practised and has become a pilgrimage ritual [*12*].

The geographic location of Medina at the critical level of *A. gambiae*'s geographic distribution does not allow the mosquito to have a firm and permanent footing in the city—the cold winters and frost drive this malaria vector to the south. Even if this mosquito succeeds in invading Medina under favourable climatic conditions, it cannot survive the winter. Zahar, in his extensive survey of Medina in 1954, could only find one specimen (a female *A. gambiae*), in a house late in that year [*13*].

The ancient Arabs knew that the spring season was the healthiest and autumn was the worst for health and was when fatal epidemics occurred. For this reason, the pharmacists (herbalists), grave diggers and body washers used to borrow money during the spring season to prepare for their prosperous season. The Prophet used to say that, "when the *najm* appears, the epidemic is lifted from all towns" [*14*]. The *najm* is a herbaceous plant with star-like flowers that appears only in the spring. This is the reason why the Prophet timed his expeditions against his opponents (or to perform *umra*) during the spring season. According to Montgomery, nine out of the 12 expeditions the Prophet conducted himself (Badr, Uhud, Al-Khandaq, Khaibar, Al-Hudaybiyah, conquest of Mecca, Hunain, Al-Taif and the farewell pilgrimage) were in the spring or early summer, and they all achieved their objectives [*15*]. On the other hand, the two expeditions conducted during the autumn (Dawmat Al-Jandal, near the present Syrian border, August–Septem-

ber 622 AD, and Tabook, near the present Jordanian border, October–December 630 AD) had indecisive results. One wonders whether malaria was a factor in these negative results, as it is known that throughout history malaria has had devastating effects on warring factions. After conducting three expeditions early in the year 630 AD (conquest of Mecca, Hunain and Al-Taif), the Prophet, being committed to the success of his mission, led the Tabook expedition late in the same year (in the period of high malaria risk). This might have exerted a great strain on his health, as one notes that all the next year (631 AD), and until he died in June 632 AD, he stayed in Medina except during the farewell pilgrimage in March 632 AD.

During the Prophet's life, ordinary attacks of malaria were treated by medicinal herbs or by drinking the milk and urine of camels that grazed on medicinal herbs such as artemesia. Hyperpyrexia was treated by pouring cold water from deep wells on the head and body, or by cauterizing the skin over the spleen. The severe complications brought about by falciparum malarial attacks, including the cerebral, circulatory, gastrointestinal and renal forms, could not be treated and usually led to death. The *Plasmodium falciparum* species of malaria parasite is the prevailing species in subtropical and tropical areas, and this species, together with *A. gambiae*, have led to malaria epidemics of high morbidity and mortality as can be seen from the present malaria situation in the subtropical and tropical areas of the world.

Death of the Prophet in Medina

The description of the disease that led to the Prophet's death has been given in detail by many Muslim scholars and chroniclers. He died on Monday 8 June in 632 AD at about 11:00, after suffering from an intermittent severe acute fever which lasted about 11 days. During the course of the disease the following signs and symptoms were mentioned:

- high fever (hyperpyrexia) ameliorated by pouring cold water obtained from wells near-by;
- very profuse sweating, the like of which his wife Aisha stated that she had never seen before;
- intermittent unconsciousness, and later when conscious being able only to communicate by gestures, not verbally;
- extreme weakness and suffering and inability to walk to the mosque situated a few steps from his house, unless helped by his disciples.

From the above description, one would strongly suspect a falciparum malarial attack as the Prophet's last illness.

Al-Ghazali, commenting 400 years later on the sufferings of the Prophet in his last illness, summarized the symptoms of the disease and commented [*16*]:

> *The Prophet was an example to all humanity both in his life as in his death. Though he was the beloved and the chosen messenger of God, he was subjected to the same pains and sufferings as would befall any mortal. While those attending him in his home wept seeing him changing colour, sweating profusely, sighing, moving his limbs restlessly, and momentarily lapsing into unconsciousness, the Prophet acted as he had always acted before, with patience and dignity, even in his extreme agony, unshaken in his trust in God, and well satisfied that he followed His Path and submitted to His Will.*

Epilogue

When one considers the malaria situation in Saudi Arabia at the present time, one must appreciate the efforts which have been made since the reign of King Abdul-Aziz Al Saud, the founder of the kingdom. Because of the malaria epidemic that occurred during the 1950 AD (1369 AH) pilgrimage, and the reports by the hospitals of some 50 000 cases of malaria, King Abdul-Aziz urged his Government to invite the World Health Organization (WHO), represented by its Eastern Mediterranean Regional Office (EMRO), to collaborate in a joint project to control malaria in the pilgrimage area [*5*]. This was the first WHO/EMRO project in Saudi Arabia, and within a few years of its initiation in 1951, the eradication of malaria from this area was completed. The success was also due to the accompanying policy conducted by the Government in the form of major development schemes (including road construction, water distribution systems, electric power installations, drainage, housing and an increase in schools). Encouraged by the success of this project, the Government, with technical help from the Arabian American Oil Company (ARAMCO) [*17*], launched a similar project in 1956 based on an intensive vector control programme within a development scheme. This led to the eradication of malaria from Al-Hasa and Al-Qatif oases (on the eastern coast of Saudi Arabia) in the mid-sixties. During the seventies, the Government eradicated malaria from the highly malarious Khaiber Oasis, mainly through a vast drainage system within the development scheme. The only area that has confounded the Government's efforts in effectively controlling malaria is the south-western coast of Saudi Arabia (south of Jeddah), which is the only area infested with *A. gambiae*. This vector exists also in Yemen and some 20 African countries situated in the same geographic limitrophe as the south-west coast of the Arabian peninsula and is associated with high morbidity and mortality. The difficulty in controlling malaria transmitted by this vector is because of its domestic habits and high vectorial capacity in transmitting malaria, which is fifteen times or more the capacity of the other vectors in Saudi Arabia such as the ubiquitous *A. sergentii*, and *A. stephensi* in the east coast. In order to combat the high vectorial capacity of *A. gambiae*, antimalarial efforts must be quadrupled under strict scientific guidance based on research on the bionomics of the vector, the biology of *P. falciparum* strains, and on trials of more effective and innovative methods of vector control. In addition, studies on the most effective methods to ensure community participation in the efforts should be carried out. The establishment of a malaria institute south of Jeddah would be a worthwhile and humanitarian enterprise that would extend its benefits to those people still living with the threat of malaria.

References

1. Russell PF. *Man's mastery of malaria*. Oxford, Oxford University Press, 1955.
2. *The Message of the Quran*. Translated and explained by Asad M. Gibraltar. Dar Al-Andalus, 1980.
3. Imam Ibn Kathir. *Interpretation of the Great Quran*. Part IV. Cairo, Establishment for the Revival of Arabic Textbooks: 548–55 (in Arabic).

4. Farid MA. The malaria programme from euphoria to anarchy. *World health forum*, 1980. (1.2):8–33.

5. Montgomery W. *Muhammad at Mecca*. Oxford, Oxford University Press, 1968.

6. *Sahih al-bukhari*. Part V. Cairo, Dar-al-Geel, 1330 AH:87–9 (in Arabic).

7. *Fath al-bari bisharh sahih al-bukhari*. Revised by Saad TA, Al-Hawari MM, Abdel-Moati EM. Part VIII. Cairo, Library of Al-Azhar Colleges, 1978:232 (in Arabic).

8. Imam Abi Abdallah Ibn Al-Kayyim Al-Jawziyya. *Zad al-ma'ad*, vol. 2. Cairo, Dar el-Fikr, 1972:78 (in Arabic).

9. *Fath al-bari bisharh sahih al-bukhari*. Introduced by Saqr EA. Cairo, Dar el-Ketab el-Gedid. Committee for the Revival of Islamic Heritage, 1969:291 (in Arabic).

10. Imam Abi Zakaria Ibn Sharaf Al-Nawawy Al-Demashky. *Riad al-saleheen*. Beirut, Al-Risala Establishment, 1981:481 (in Arabic).

11. Boyd MF. *Malariology*, vol 2. London, WB Saunders, 1949.

12. *Fath al-bari bisharh sahih al-bukhari*. Revised by Saad TA, Al-Hawari MM, Abdel-Moati EM. Part VII. Cairo, Library of Al-Azhar Colleges, 1978:264–5 (in Arabic).

13. Zahar AR. *Vector bionomics in the epidemiology and control of malaria: Part 1*. Geneva, World Health Organization 1985: 221 (unpublished report VBC85.3; available on request from Division of Tropical Disease Control, World Health Organization, CH-1211 Geneva 27, Switzerland).

14. Shams el Din M. Ibn Al-Kayyim Al-Jawziyya. *Al-tib al-nabawy*. Introduced and annotated by Abdel-Khaliq A, Al-Azhari A, Al Okda MF. Cairo, Establishment for the Revival of Arabic Textbooks, 1957:32 (in Arabic).

15. Montgomery W. *Muhammad at Medina*. Oxford, Oxford University Press, 1968.

16. Imam Al-Ghazali. *Ihya ulum al-din*. Introduced by Tabana B. Part IV. Cairo, Establishment for the Revival of Arabic Textbooks, 1957:453–60 (in Arabic).

17. Daggy RH. Malaria in oases of eastern Saudi Arabia. *American journal of tropical medicine and hygiene*, 1959, 8(2):223–9.