

Parasites and Microbes On the Bodies of Mosquitoes: A Systematic Review Based on the Tafsir of Surat Al-Baqarah, 2:26 and Signs in Modern Medicine

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Abstract: This study has adopted a qualitative systematic review design to analyze the reason behind the revelation of Qur'an, 2:26 and its implications according to the signs in modern medicine. The relevant tafsir of the Qur'anic verses were collected from famous tafsir of the Qur'an. Data concerning modern medicine were collected from the published articles screened from **MEDLINE** and **PUBMED** databases. Data were then analyzed by Thematic analysis to show what Allah (S.W.T) has shown the medical experts with regards to what He has revealed in this verse. The results show that the phrase *فَمَا فَوْقَهَا* used in the phrase *إِنَّ اللَّهَ لَا يَسْتَحْيِي أَنْ يَضْرِبَ مَثَلًا مَّا بَعُوضَةً* of this verse exposes that Allah (S.W.T) has dispersed small creatures [such as parasites and microbes] 'on top' of the mosquitoes' bodies. This study may provide us with a glimpse of the wonders of the Qur'an and the Majesty of Allah (S.W.T).

Keyword: Water mites, parasites, microbes, microbiota, mosquitoes

1. Introduction

Al-Imam Ibn Jarir At-Tabari in his tafsir (tafsir At-Tabari) has reported that Ibn 'Abbas, Ibn Mas'ud and other companions (R.A) said that, when Allah (S.W.T) gave us examples of a man who kindled a fire [إِنَّ اللَّهَ الَّذِي اسْتَوْفَدَ نَارًا] (Surat Baqarah, 2:17), the deaf, the dumb and the blind [صُمٌّ بُكْمٌ عُمِيٌّ] (Surat Baqarah, 2:18), a rainstorm from the sky, wherein are darkness, thunder and lightning [أَوْ كَصَيْبٍ مِنَ السَّمَاءِ فِيهِ ظُلُمَاتٌ وَرَعْدٌ وَبَرْقٌ] (Surat Baqarah, 2:19), and the lightning almost snatches away their sight [يَكَادُ الْبَرْقُ يَحْطِفُ أَبْصَارَهُمْ] (Surat Baqarah, 2:20), hypocrites and polytheists said: God is Exalted in Might, He cannot set such examples.

Similarly, Al-Imam Al-Qurtubi in his tafsir [Al-Jaamiul Ahkaamil Qur'an] reported that, in the narrations of Ata from Ibn 'Abbas (R.A), when Allah (S.W.T) set an example for the gods of the polytheists that, if the fly snatches away a thing from them, they will have no power to release it from the fly [وَإِنْ يَسْأَلْنَهُمْ الدَّبَابُ شَيْئًا لَا يَسْتَنْفِذُوهُ مِنْهُ] the likeness of those who take (false deities as) *auliyaa* (protectors, helpers) other than Allah (S.W.T) is likeness of a spider who builds (for itself) a house [مَثَلُ الَّذِينَ اتَّخَذُوا مِنْ دُونِ اللَّهِ أَوْلِيَاءَ كَمَثَلِ الْعَنْكَبُوتِ اتَّخَذَتْ بَيْتًا] (Surat Al-'Ankabuut, 29:41), hypocrites and polytheists said again: It is impossible for God to give such examples.

Similarly, Al-Imam Al-Qurtubi reported that Al-Hasan and Qatadah said: When Allah (S.W.T) gave the parables of the fly and the spider in the Qur'an, the Jews laughed and said: This cannot be a revelation from God. Thus, from their words, then Allah (S.W.T) revealed this verse:

إِنَّ اللَّهَ لَا يَسْتَحْيِي أَنْ يَضْرِبَ مَثَلًا مَّا بَعُوضَةً فَمَا فَوْقَهَا فَأَمَّا الَّذِينَ آمَنُوا فَيَعْلَمُونَ أَنَّهُ الْحَقُّ مِنْ رَبِّهِمْ وَأَمَّا الَّذِينَ كَفَرُوا فَيَقُولُونَ مَاذَا أَرَادَ اللَّهُ بِهَذَا مَثَلًا يُضِلُّ بِهِ كَثِيرًا وَيَهْدِي بِهِ كَثِيرًا وَمَا يُضِلُّ بِهِ إِلَّا الْفَاسِقِينَ

Indeed, God is not timid to present an example; that of a mosquito or what is smaller than it [literally, above it, i.e., greater in smallness]. And those who have believed know that it is the truth from their Lord. But as for those who disbelieve, they say, “What did God intend by this as an example?” He misleads many thereby and guides many thereby. And He misleads not except the defiantly disobedient (Surat Al-Baqarah, 2:26) [Saheeh International Translation].

2. Statement of the Problems

According to the Al-Mawrid and Hans Wehr dictionaries, the Arabic word فوق used in the Qur’an, 2:26 [in the phrase فَمَا فَوْقَهَا] has the meaning of ‘up’, ‘above’, ‘over’, ‘on’, ‘on top of’, ‘top of’, ‘upstairs’, ‘more than’, ‘higher than’, ‘superior to’, ‘more eminent than’ etc. That is why when you read different commentaries of the glorious Qur’an you will see that even commentators of the famous tafsir of the glorious Qur’an are differing in the meaning of the phrase فَمَا فَوْقَهَا. Some say the meaning of this phrase is more than [the mosquito] (Al-Imam At-Tabari and Al-Imam Ibn Kathir etc.), some say is less than [the mosquito] (Al-Imam Al-Qurtubi, Muhammad Asad who has quoted Zamakhshari, Al-Imam ibn Kathir etc.). But there is one tafsir stated in Al-Mawrid Dictionary which was not used by the commentators. This tafsir is ‘on’ or ‘on top of’, or ‘above’; meaning that on the bodies of the mosquitoes themselves.

Even though more than and higher than are among of the meanings of the word فوق, but actually the phrase فَمَا فَوْقَهَا should not be understood as greater than [the mosquito] because such understanding contradicts the immediate reason for the revelation of this verse. Allah (S.W.T) revealed this verse as a response to the hypocrites and polytheists who ridiculed the previous parables [as stated in the introductory part] as being beneath the Majesty of Allah to give similitudes of such minute insects. It is also incongruous and highly speculative to understand it as “less than” the mosquito in view of the meanings of the word فوق itself [as stated above]. It is quite obvious that at the time they were writing their commentaries, they were not aware that Allah (S.W.T) has also dispersed very small creatures on the bodies of the mosquitoes. This is due to the fact that powerful microscopes were not discovered until 10/11th centuries later after the departure of the prophet Muhammad (S. A. W). Therefore, the specific focus of this study is to fill this gap by showing the most appropriate tafsir of this phrase in the light of the current knowledge in medicine.

3. Methodology

This study has used a qualitative systematic review study design. The relevant translations of the Qur’anic verses were collected from the leading commentators of the glorious Qur’an, namely, Tafsir Al-Qur’an Al- ‘Adhwim of Al-Imam Ibn Kathir, Al-Jaamiul Ahkaamil Qur’an of Al-Imam Al-Qurtubi, and The Message of the Qur’an of Muhammad Asad. Data concerning modern medicine – which from the Islamic point of view are signs from Allah (S.W.T) were obtained from the published articles screened from MEDLINE and PUBMED databases. Key words used were *water mites, parasitize, hyperparasitism, microbes, normal microbiota, bacteria, and mosquitoes*. The data obtained were then analyzed using the Thematic approach to show what Allah (S.W.T) has shown the medical experts with regards to what He has revealed in the Surat Al-Baqarah, 2:26.

4. Results and Discussion

The verse under discussion [Surat Al-Baqarah, 2:26] points to the two important aspects of mosquitoes: (1) The mosquito itself [see the phrase إِنَّ اللَّهَ لَا يَسْتَحْيِي أَنْ يَضْرِبَ مَثَلًا مَّا بَعُوضَةً (Indeed, God is not timid to present an example - that of a mosquito)]. (2) What is on its body [see the phrase فَمَا فَوْقَهَا (‘on’ or ‘on top of’ it)].

With regards to aspect number 1, the Arabic word بَعُوضَةً used in this verse [Surat Al-Baqarah, 2:26] implies a female mosquito ([https://corpus.quran.com/wordmorphology.jsp?location=\(2:26:9\)](https://corpus.quran.com/wordmorphology.jsp?location=(2:26:9))). This means that the mosquito which is referred to in this verse is a female mosquito. Man is being invited by Allah (S.W.T) to conduct research and contemplate on the signs of both the morphology and physiology of the mosquitoes, particularly the female mosquitoes, which is not the focus of this study. But in brief, studies show that only the larger female mosquitoes bite because they need blood nourishment for egg production (Alphey, 2009). A mosquito is exposed to the pathogen when it takes a blood meal from an infectious vertebrate [or contaminated environment]. For example, the virus infects the mosquito, typically first in the midgut and then disseminating the same through its body. When its salivary glands become infected as a result of the viruses present in the mosquito’s saliva, she becomes infectious. The next time she takes a blood meal, her food source is exposed to the viruses. If this individual becomes infected, for a period of time that individual will in turn infect other mosquitoes that bite it, and hence the viruses will continue to propagate and spread (Alphey, 2009).

Thus, female mosquitoes are the vectors of a broad range of causative agents of harmful viral and parasitic diseases affecting both humans and animals via either contaminating various fomites or through bites (Huang *et al.*, 2020; Alphey, 2009). They carry a broad range of the causative agents of diseases [parasites and viruses] that cause diseases such as Malaria, Zika, Lymphatic filariasis, Dengue, Yellow fever, Chikungunya, Japanese encephalitis and West Nile fever (WHO, 2020). It is unknown exactly how many people are affected by mosquito bites annually as most go unreported. What is known is that mosquito-borne diseases cause a tremendous disease burden, infecting 700 million and causing a

million deaths every year (Caraballo & King, 2014). The mention of the sex of the mosquito [female sex] in this verse is the miracle by itself. This is because medical experts were not aware about mosquitoes' sexes until 1897 when Ronald Ross discovered that malaria is caused by the female mosquito [anopheles mosquito] after Antoni van Leeuwenhoek discovered the new world of microbes via his home-made primitive microscope in 1676 (Cox, 2010).

With regards to aspect number 2, which is actually the focus of this paper, we are not aware of any previous study which has highlighted the meanings of 'on' or 'on top of' to the phrase *فَمَا فَوْقَهَا* in relation to the signs that Allah (S.W.T) has shown medical experts in the modern medicine. The data show that the insects; including mosquitoes, harbor microbes and parasites, and their diversity varies depending on the sex of the mosquito, the developmental stage, and ecological or environmental factors (Minard *et al.*, 2013). The microbes include microbes such as pathogens [e.g., bacteria, virus, fungus and protozoa] and normal microbiota [e.g., *Wolbachia*]. The parasites include water mites (Dennison *et al.*, 2014). Most mosquitoes inhabit the aquatic environment rich in organic matter, vegetation, animal cadavers, and dejections, insect's breeding water and nectar sources. These environments favor the flourishing of microbes and parasites (Girard *et al.*, 2021; Dennison *et al.*, 2014; Hochberg and Ives 2000).

The mosquitoes are exposed to microbes and parasites during their interactions with the above ecosystems (Alphey, 2009). Some of these microbes and parasites are found 'within' the bodies of the mosquitoes in various organs such as the midgut, reproductive organs [e.g., ovaries], Malpighian tubules, and hemocoel. These include viruses [e.g., arboviruses], bacteria (e.g., *Wolbachia*) and protozoa (e.g., plasmodium). Some are found on the various parts of their bodies such as on head, thorax, abdomen and appendages. These include parasitic water mites and *Wolbachia* (Huang *et al.*, 2020; Atwa *et al.*, 2017; Dennison *et al.*, 2014; Minard *et al.*, 2013). The phrase *فَمَا فَوْقَهَا* basically refers to this sign.

The most reported microbe is *Wolbachia*. It is found 'on top' and 'within' the bodies of the mosquitoes. It was first identified in the reproductive tissues of mosquitoes *Culex pipens* by Hertig and *Wolbachia* in 1924 and the species was later named *Wolbachia pipientis* (Guruprasad *et al.*, 2014). In the bodies of the mosquitoes, it has been reported to interact with a number of pathogens and affect their reproduction, which then affect their life cycle. They also indirectly support and up-regulate the mosquito host immune system, helping them to resist the effects of the pathogens such as inhibition of pathogen replication or multiplication. As an alternative to traditional control measures, the bacterial symbiont *Wolbachia* has been transferred from *Drosophila* into the mosquito *Aedes aegypti*, where it can block the transmission of dengue and Zika viruses (Guruprasad *et al.*, 2014).

The most reported parasite on the bodies of the mosquitoes are parasitic water mites in the form of hyperparasitism. This is another thing included in the phrase *فَمَا فَوْقَهَا*. Note that parasitism is one of the most successful life forms on earth. For this special form of hyperparasitism, a parasite is infested by another parasite which may influence his life cycle. Female mosquitoes are among the main groups of ectoparasites that are known to be vectors of a huge variety of important human and animal pathogens. In the freshwater habitats, water mites (Acari: Parasitengonina: Hydrachinidae) are among the most diverse groups of living organisms. Their life cycle involves egg, pre-larva, larva, three nymphal stages and adult stage. Among these, adults and nymphs are free living, and most larvae act as parasites. Larvae need to parasitize [the mosquitoes or other living organisms] to complete their life cycle (Atwa *et al.*, 2007). The first record of water mite's parasites on mosquitoes was in 1778 by DeGeer; a first entomologist to engage in the research of parasitic water mites on the bodies of mosquitoes. Since then, 241 reports of water mites that parasitize the mosquitoes have been recorded; fifty of them occurred in Europe. The majority of the water mites recorded belong to the genera *Thyas*, nowadays placed in the genus *Parathyas* (Hydrphantidae: Euthyadinae) and *Arrenurus* (Arrenuridae), that both act as obligate ectoparasites on the bodies of the adult mosquitoes (Werblow *et al.*, 2015).

In one study (Atwa *et al.*, 2017), a total of 8954 individual mosquitoes that belong to 6 genera and 23 species were investigated. All species of water mites preferred female mosquitoes as their host; remember a verse we are discussing mentioned a female mosquito. Only fewer than 6.5% of the male mosquitoes were parasitized by various species of parasitic water mites. During their attachment (on both male and female mosquitoes' bodies), they preferred host's thorax as compared to the head, pre-abdomen and appendages. Likewise, Werblow *et al.* (2015) reported that the attachment sites for the water mites on mosquitoes are located between the neck and abdomen; with the ventral thorax site being the most frequent one. Unlike *Wolbachia*, larval water mite hyperparasitism of adult mosquitoes has been shown to reduce mosquito fecundity and life span in the laboratory and affect some populations in the field. Water mites have been considered for biological control purposes and used to age-grade mosquito populations (Manges *et al.*, 2018; Dennison *et al.*, 2014). On the other hand, their wide occurrence, intensity of infection, parasitic load, and attachment preferences suggest their positive role in biological control of adult mosquitoes; particularly the female mosquitoes that are the vectors of a number of causative agents of various diseases (Atwa *et al.*, 2017; Werblow *et al.*, 2015).

These reports deserve special consideration and reflection. On the one hand, the microbiota 'within' the bodies of the mosquitoes influence them positively by interacting with pathogens and shortening their life cycle, and enhancing the mosquito's immune system, thereby helping them to resist the effects of the pathogens. This helps the mosquitoes finish their life cycles without being affected by the pathogens. On the other hand, the parasites on the bodies of the mosquitoes influence them negatively by weakening them and shortening their life cycle. This shortens the life cycle of the mosquitoes [which is 8-10 days according to CDC] and thereby reducing their population around the world.

The exposition of the small creatures on the bodies of mosquitoes which are too small to be seen by our naked eyes (microorganisms), is another miracle. This is so because the knowledge about the existence of microorganism was not

possible until 1676 when Antoni van Leeuwenhoek discovered the microbes (Cox, 2010). As said earlier, the first record of water mites' parasites on mosquitoes was in 1778 by DeGeer, and Wolbachia; the most reported microbiota 'on top' and 'within' the mosquitoes, were first identified in the reproductive tissues of mosquitoes *Culex pipens* by Hertig and Wolbachia in 1924 (Werblow *et al.*, 2015; Guruprasad *et al.*, 2014).

This shows that the above verse and the entire Qur'an, are the actual and intact words of Allah (S.W.T); the creator of the heavens and Earth. These discoveries were only possible after the discovery of different types of microscopes [from 1676 onwards], and prophet Muhammad (S.A.W) did not have any instrument, no matter how primitive which could have enabled him to conduct even a simple observation. This also shows that all the knowledge from the researchers reported in this study and others, are the signs from Allah (S.W.T). For the Qur'an has specifically stated that promise in the *Surat Fussilat*, 41:53 and *Surat An-Naml*, 27:93:

سَنُرِيهِمْ آيَاتِنَا فِي الْأَفَاقِ وَفِي أَنفُسِهِمْ حَتَّىٰ يَتَّبِعَنَّهُ لُحْمٌ أَلْمُ الْحَقُّ ۗ أَوَّلَٰمٌ يَكْفُرُ بِرَبِّكَ أَنَّهُ عَلَىٰ كُلِّ شَيْءٍ شَهِيدٌ

We will show them Our signs in the horizons and within themselves until it becomes clear to them that it is the truth. But is it not sufficient concerning your Lord that He is, over all things, a Witness? (*Surat Fussilat*, 41:53).

وَقُلِ الْحَمْدُ لِلَّهِ سَيُرِيكُمْ آيَاتِهِ فَتَعْرِفُونَهَا ۗ وَمَا رَبُّكَ بِغَافِلٍ عَمَّا تَعْمَلُونَ

And say, "All praise be to God. He will show you His signs, and you will recognize them. And your Lord is not unaware of what you do" (*Surat An-Naml*, 27:93).

5. Conclusion

This study has highlighted how just a very short phrase [فَمَا فَوْقَهَا] in a short verse [إِنَّ اللَّهَ لَا يَسْتَحْيِي أَنْ يَضْرِبَ مَثَلًا مَّا بَعُوضَةً] (Indeed, God is not timid to present an example - that of a mosquito) has traversed a number of details about mosquitoes. These details include their morphology, physiology as well as their parasites and microbes. It has analyzed thematically the presence of parasites and microbes 'on top' and 'within' the bodies of the mosquitoes, together with their influence on their physiology; which include how the microbiota influence them positively and how parasites deteriorate them and cut-off their life cycle. This is one area in the mosquito studies which has recently started to receive more attention from scholars of medicine. The Qur'an, through a short but compactly packed phrase has managed to incorporate all aspects of the mosquitoes that have been discovered and those which are still under investigation. This unique economy of expression which points out to vast and complex expanses of knowledge is an observable characteristic of the Qur'an in all other fields of study.

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