International Journal of Mosquito Research 2024; 11(3): 01-11

International Journal of Mosquito Research

ISSN: **2348-5906**
CODEN: **IJMRK2**
IJMR 2024; 11(3): 01-11

https://www.dipterajournal.com
Received: 02-01-2024
Accepted: 05-02-2024

Review of feeding, biting and resting behaviour of *Aedes aegypti* and *Aedes albopictus*

Subrat Kumar Panigrahi, Opal Priyadarshini, Alok Jena, Ananta Jhankar and Sudhir Mishra

Subrat Kumar Panigrahi
Department of Zoology,
Kalahandi University,
Bhawanipatna, Odisha, India

Opal Priyadarshini
Department of Zoology,
Kalahandi University,
Bhawanipatna, Odisha, India

Alok Jena
Department of Zoology,
Kalahandi University,
Bhawanipatna, Odisha, India

Ananta Jhankar
Department of Zoology,
Kalahandi University,
Bhawanipatna, Odisha, India

Sudhir Mishra
Department of Zoology,
Kalahandi University,
Bhawanipatna, Odisha, India

Corresponding Author:
Subrat Kumar Panigrahi
Department of Zoology,
Kalahandi University,
Bhawanipatna, Odisha, India

DOI: https://doi.org/10.22271/23487941.2024.v11.i3a.771

Abstract

Aedes-borne diseases (ABDs) like chikungunya, dengue, yellow fever and zika are an emergent problem in the world. This review surveys the literature on the feeding, biting and resting habits of *Ae. aegypti* and *Ae. albopictus*, drawing attention to study findings to evaluate control interventions and highlighting knowledge gaps for future research and surveillance in this research field. There are great variations in the feeding, biting and resting behaviours of *Aedes* in different geographic areas and different seasons for which little is known. The observations made in this study conclude that there is a need for, proper verification of the ecology and behaviour of the concerned vectors, and more dedicated research which needs consideration of multiple factors in multiple geographic areas to assess behaviour of *Aedes* that influence at least one behavior of *Aedes.*

Keywords: *Aedes*, feeding, biting, resting, behaviours

Introduction

Mosquitoes (Diptera: Culicidae) are one of the most vital vectors of many diseases like yellow fever, dengue fever, chikungunya, zika fever, malaria and filaria for vertebrates [1]. Now a days *Aedes* borne diseases (ABDs) like chikungunya, dengue, yellow fever and zika are progressively becoming a global concern [2]. Dengue is the most widespread *Aedes* borne viral disease worldwide [3]. Dengue cases have increased about eightfold over the last two decades, reported by the World Health Organization (WHO) [4]. It was estimated that each year, around 50 million cases of dengue are recorded, with around 2.5 billion individuals live in countries where dengue is endemic [5]. Dengue is spread by several species of female *Aedes* mosquitoes. *Ae. albopictus* (Skuse, 1894) alone has been confirmed to be the prime vector in some of the recorded dengue outbreaks [6]. But *Aedes aegypti* (L.), the main carrier of the dengue virus (DENV), is found abundantly in tropical and subtropical regions of the world [7]. It is highly adapted to urban areas and completes its life-cycle in and around the human settlement, primarily feeding on humans [3]. *Aedes albopictus* otherwise known as the Asian Tiger mosquito, is responsible for the worldwide emergence and spread of chikungunya [8] and is potentially responsible for Zika in different parts of the world [9]. The population density of *Aedes albopictus* is more in rural and suburban areas [10, 11] and it has adapted to human-induced alterations in its surroundings, usually by preferring to feed on humans and domestic animals [12]. *Aedes albopictus*, an invasive mosquito species, has its origins in the tropical forest of South-east Asia [13, 14] and has spread to tropical and subtropical regions of America, Africa and Europe in the last three decades [15]. Primarily a sylvatic species, *Ae. albopictus* poses a significant public health concern due to its ability to transmit various arboviruses, potentially surpassing that of *Ae. aegypt* [16]. *Ae. albopictus* shows aggressive anthropophilic behaviour and great adaptability in different habitats [17, 18]. It breeds in tree holes, coconut shell, artificial containers, axils of leaves, discarded tyres, etc. *Aedes aegypti*, is known for its daytime biting behavior and is normally found in close proximity to human habitations, making it a primary vector in urban areas [19]. *Ae. aegypti*, exhibits at least two different variants (*Ae. aegypti formosus* (Walker) (*Aaf*) and *Aedes aegypti aegypti* (L.) (*Aaa*) [20].

The primitive variant of *Aaf* is unknown, but it is found in many areas both forests and urban area [21, 22], has a minor role in transmitting human disease [23–25]. But in West Africa *Aaf* are considered as competent vectors of flaviviruses [26, 27] and also homologues type to *Aaa* commonly utilizes human-made containers as breeding sites for their larvae [28, 29].

The most common and familiar *Aedes* mosquitoes are *Aaa* [02]. In the twenty-first century, *Aaa* has emerged as a persistent pest in urban regions across the tropics and sub-tropics regions of the world [20]. The synanthropic behavior would have developed in *Aaa* when they expanded their range from Africa through human movements, frequently undertaking long-distance journeys [30, 31]. Rapid urbanization and infrastructure development may be the cause of alternation in land use pattern brings close contact of both humans and sylvatic vertebrate reservoirs, is one of the main causes of increasing of *Aedes* borne diseases ABDs [7]. Additionally, it generates numerous aquatic breeding sites suitable for the two primary arboviral vector species, *Aedes aegypti* and *Aedes albopictus* [32], meanwhile increased intercontinental merchandise and the expansion facilitates the dispersion of mosquitoes beyond their original lands [33].

In India, *Ae. aegypti* stands out as the most competitive primary vector for the outbreak of epidemics of Dengue and Chikungunya while *Ae. albopictus* and *Ae. vittatus* serves as another potential vector for these diseases. *Ae. aegypti*, with an anthropophilic index, is an urban vector in India. The population densities of *Ae. aegypti* fluctuates with rainfall and water storage habits of man. Like *Aedes albopictus*, this species also breeds in various natural and artificial containers, including tree holes, pots, discarded tyres, plastic containers, open tanks, air coolers, etc. Because of poor solid waste management in many urban areas, stagnant water bodies provide congenial breeding sites for the vectors.

Abiotic environmental factors such as temperature, humidity, and precipitation have also influenced the dispersion of *Aedes* mosquitoes and their patterns of disease transmission [34]. The environmental temperature influences the physiology, behavior, ecology and survival of the insects because they are poikilotherms [35]. Global warming is also responsible for the changing of behavior of *Aedes* in different parts of the world. Consequently, arboviral diseases emerge and re-emerge. It has become a global concern and a threat to human health [36]. We can say Eco-physiological differences are developed in between *Ae. aegypti* and *Ae. albopictus* because of differences in thermal niches. This creates a different distribution pattern and disease transmission risk, at present and in the future [37, 38]. The viruses usually circulate among wild animals, but can sometimes be transmitted to humans, leading to epidemics [39]. Vector control is the primary method for preventing, controlling and managing arboviruses due to the lack of specific treatments and effective vaccines, with the exception of yellow fever [40]. The successful completion of the infection cycle requires the coexistence, and interaction, in space and time between the host and reservoir, the vector and the pathogen. Usually, *Aedes* tend to move outdoors in the afternoon, possibly in search of oviposition sites. Oviposition reaches its peak in the late afternoon to early evening [41]. The interaction between host and reservoir is vital for the vector to transmit the pathogen and subsequently infect another host. Apart from influencing pathogen transmission, the choice of host can also impact egg production, consequently affecting vector abundance [42]. It is the right time to implement vector control strategies to combat *Aedes* mosquitoes and prevent the emergence of ABDs as well as to explore the behavior of adult *Aedes* is important to take for other research; will be helpful to make the vector control strategies.

2. Research approach

Anthropogenic climate change-related increases in global temperatures have also been a positive factor for *Aedes* expansion [43]. During the same timeframe, chikungunya emerged and spread globally [44], all four dengue serotypes spread globally [45], and the Zika pandemic, along with the public health emergency of 2016, occurred [46]. Dengue currently threatens over half of the world's population. Yellow fever, responsible for 30,000 deaths yearly and potentially more if one of the urban outbreaks threatening Africa and Brazil [47, 48] materialises, is mostly spread by *Aedes aegypti aegypti*, a key urban vector. In the modern era, *Aaa* has also spread to temperate regions [49–52], and tiny sporadic populations have been discovered as far north as Canada [53] and Germany [54]. *Aedes aegypti* adult mosquitoes are more prevalent in Africa aligns with their adaptation to the domestic environment, as their abundance exhibits a positive correlation with increasing urbanization [21, 55-59]. It may not have been possible to stop the global spread of *Aaa* borne arboviruses, but human society as a whole has a major portion of the blame for this threat to public health. The three causes that Gubler first identified in 2011—urbanisation, travel, and insufficient vector control—now include anthropogenic climate change [32, 60]. It is difficult to control this vector's population and spread. It cannot be eradicated unless there are substantial adjustments made to the patterns of growing urbanisation, migration patterns, and the rate of human-caused climate change.

Aedes mosquitoes and their propagation was the subject of repeated unresolved issues in several study publications that were examined. The need for study has to be recognised urgently since arboviral epidemics are out of control and have killed thousands of people. In order to dispute it, accurate confirmation of the vectors' behaviours, ecology, and breeding characteristics is needed. In an effort to fill in knowledge gaps and solve this problem, we reviewed the literature on adult *Aedes* mosquito behaviour, focusing on two important species: *Aedes albopictus* and *Aedes aegypti*. The feeding, biting, and resting behaviours of *Ae. aegypti* and *Ae. albopictus* has been extensively studied in the scientific literature. Results from the research are highlighted to evaluate control efforts and to identify areas that require further investigation and monitoring in this area.

3. Materials and Methods

We carried out an in-depth search for peer-reviewed studies that look into the eating, biting, and resting behaviours of *Aedes aegypti* and *Aedes albopictus*. The objective of this investigation was to compile extensive data on these features of the two mosquito species. We used the terms *Aedes aegypti* and *Aedes albopictus* along with keywords like biology, bionomics, behaviour, breeding/larval sites, biting, host-seeking, blood feeding, and resting to search the PubMed database and Google for our literature review [20]. The goal of this extensive search was to find appropriate information on a range of topics related to the biology and behaviour of these mosquito species. We chose papers, articles, and reviews in English that provided the most comprehensive information on the subjects about the behaviour of *Aedes aegypti* and *Aedes albopictus* from the huge body of literature that is accessible on these species. This strategy ensured that significant study findings were reviewed with attention. We used the references listed in the chosen articles as a means of tracking down and looking for the sources of particular data. This enabled us to cross-validate widely acknowledged but not supported by evidence facts. A total of 156 papers about the feeding, biting, and resting behaviours of *Aedes aegypti* and *Aedes albopictus* were selected using a systematic search. The evaluation procedure included these articles for more examination. 130 articles remained for full-text assessment after being eliminated based on (i) language criteria and (ii) title and abstract inspection [02]. 65 research articles fulfilled the inclusion criteria after a careful evaluation of the full-text articles with the exclusion and inclusion criteria. The final review was conducted based on these 65 publications, which ensured a thorough examination of relevant studies on the behaviour of *Aedes aegypti* and *Aedes albopictus*.

4. Binomics of *Aedes*

4.1 Feeding Preference

The feeding behaviour of mosquitoes is unique. Only the adult female mosquitoes bite human and other animals, while the male mosquitoes feed on plant juices. But other studies reported females feed on nectar [61] and in Puerto Rico [62], there are reports of using human blood as a source of energy, supplemented by feeding sugar to restore energy reserves when hosts are not available. This practice is documented in various sources [63, 64]. Some species of female mosquitoes prefer to feed only on one type of animal, while others feed on a variety of animals, including domesticated animals, birds, and wild animals. Every female mosquito must have to feed on animals to get a sufficient blood meal before it develops eggs. If the blood meal is insufficient, the female dies without laying viable eggs. In outdoor-resting females showed that *Ae. albopictus* preferentially fed on humans rather than on available domestic animals [65]. The host feeding pattern of a mosquito population refers to the distribution of different hosts at a specified time and place. Numerous factors, including both inherent mosquito species features and external environmental conditions, can modify this pattern [66]. The tendency to feed more frequently on a specific host or group of hosts in relation to their availability in the environment is known as host preference. This choice can differ amongst mosquito populations and is also influenced by a number of factors, including the availability of hosts and the traits of the mosquito species. It is determining genetically, is also an intrinsic factor [67]. In a variety of settings, female mosquitoes use their senses to accurately identify their hosts; however, they prioritise smell above taste and eyesight [41]. This significance on scent shows how important odour detection is to mosquitoes' host-seeking activities in a variety of environments. Kairomones are substances that cause a favourable behavioural or physiological reaction in the recipient while being harmful to the donor or emitter. These materials effectively communicate a response in mosquitoes. These compounds are essential in directing mosquito behaviour towards appropriate hosts or breeding grounds. Breath, skin secretions, microbial degradation products, urine, and faeces on the skin are a few of these volatile substances that function as host cues [68]. Because they signal the presence of suitable feeding spots, these cues are essential in guiding mosquitoes towards potential hosts. Some mosquito species are considered specialist displaying proficient feeding habits, while others specialise in feeding on specific hosts of their preference. A number of investigations have been conducted in this context to predict the best feeding resource choices that organisms should make in order to optimise their fitness. Host specialisation becomes predictable when the organism often encounters favourable host species and obtains energy from a restricted number of resources [69]. This expectation arises from the possibility that organisms modify their feeding habits to take advantage of plentiful and highly energetic resources. There is a trade-off between waiting for the best host and dying before reaching it in locations where the possibility of coming across hosts is minimal. In this scenario, a marginal difference in energy gained favours generalise [69, 70]. In contrast to species with narrow host ranges that are greatly impacted by host distribution, mosquito species with broad host preferences are less affected by the distribution of particular hosts. This variation highlights how different mosquito species are in terms of adaptation and dependence on host availability [71]. Not only various mosquito species and but also populations exhibit variations in blood-feeding behaviour, but within individual populations as well. The variety of choices brings attention to the complicated relationships among factors that affect mosquito communities' feeding preferences. There are geographical and temporal changes in blood-feeding behaviour, which can be related to both innate qualities and environmental factors. The intricate interactions between internal and external elements that influence mosquito feeding behaviour, which can change with time and space, are made clear by these patterns. Mosquitoes are influenced by genetics or innate tendencies to favour the same host as their ancestors. In addition to flight ability, feeding preferences are also influenced by nutritional state; undernourished mosquitoes are more inclined to feed on non-preferred hosts. Mosquitoes also differ in terms of behavioural characteristics that influence feeding patterns, such as frequency, time, and location of feeding [42, 69, 72]. This behaviour is also influenced by secretions from male accessory glands, which makes mated females more inhibited than unmated ones in their search for hosts following a large blood meal. These secretions influence the behaviour of female mosquitoes after feeding and help to shape their feeding habits [73, 74]. Mosquito behaviour is influenced by a variety of external factors, including host availability, abundance, defence strategies, emitted chemicals, climatic conditions, and habitat features. Mosquitoes' overall feeding habits are influenced by these external factors, which also determine when and where they feed [42, 75, 76]. Numerous mosquito species have a flexible host preference, which means they change their selection in situations where their preferential hosts are not accessible or when their energy stores are low because of reduced reaction levels. In addition to preventing mosquitoes from leaving their habitat, unfavourable weather patterns can also affect the choice of hosts that they bite. Takken and Verhulst (2013) investigated this observation, pointing out how adaptable mosquitoes are to their surroundings [41]. A large number of *Culex* species favour feeding on birds in the spring and summer. But as bird populations decline, they migrate to new hosts, such as human [77, 78]. This shift in preference demonstrates how these mosquitoes may adjust to changing host availability over the year. This suggests that whereas some species might have unique preferences that suit them well in their environment, others may be able to adapt to feed on hosts that are found in many places. Certain types of mosquitoes can search for blood in a range of habitats and from a variety of hosts. In dire circumstances, a mosquito's willingness to feed on blood might be determined by the availability of hosts. Mosquito feeding behaviour is greatly influenced by host availability, which determines whether or not they will seek blood meals. Species of mosquitoes that can lay eggs without a blood meal usually inhabit areas where there are few hosts [69, 79]. The adaption allows them to reproduce even when host are hard to find.

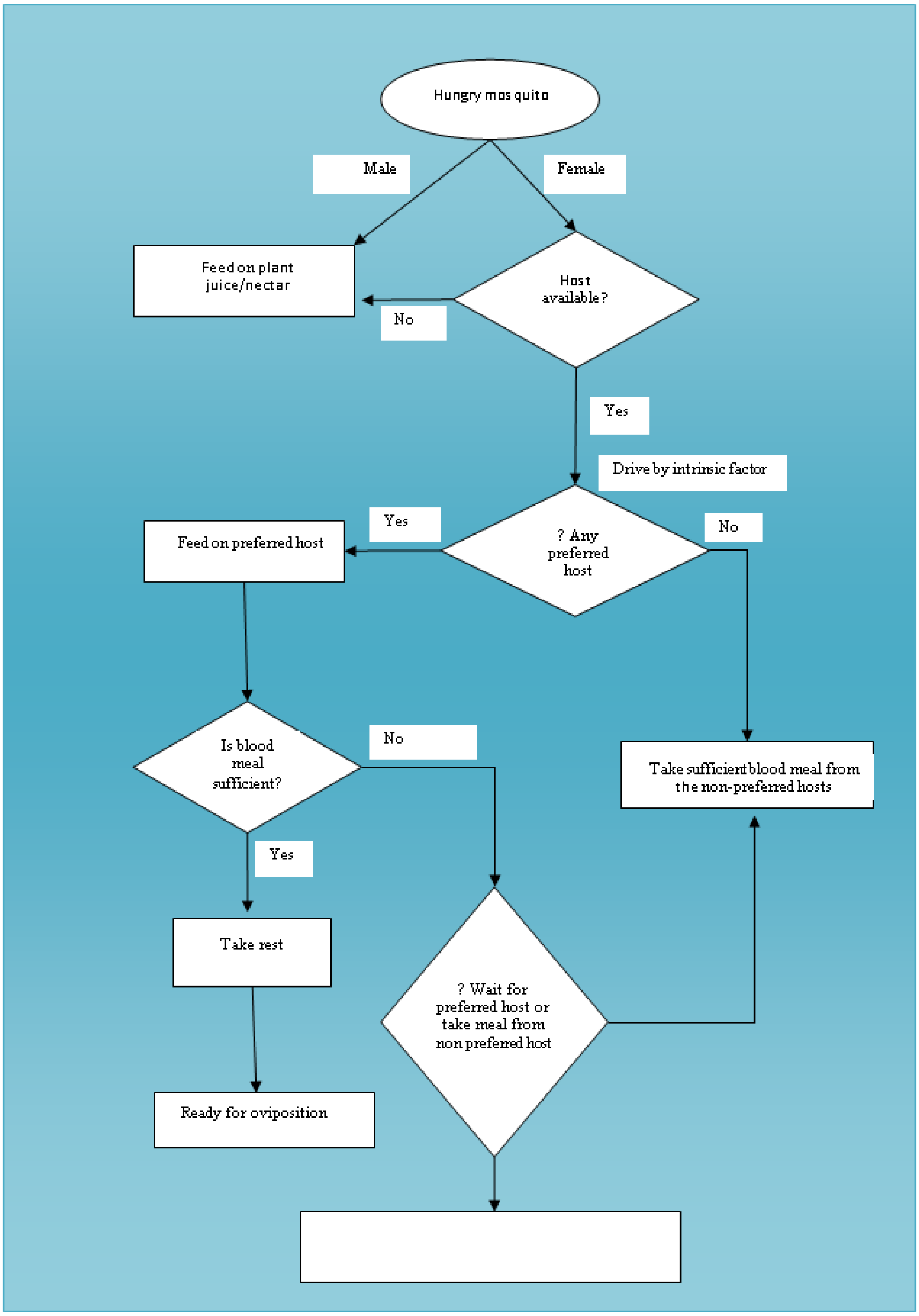

Fig 1: Understanding of feeding preference of *Aedes*

From these studies, we summarise the feeding preference behaviour of *Aedes* in the flow chart **(**Figure 1). This helps us understand this important behaviour. In this study, several control strategies may be developed to prevent ABDs. If a preferred host is available (other than a human), there may be a reduction in the biting of *Aedes*, which means a decline in disease transmission.

Blood feeding habits of mosquitoes have a great impact on pathogen transmission and transmission of mosquitoes. Pathogens that depend on a single host are less likely to be spread by a mosquito species that consumes a variety of hosts. On the other hand, mosquitoes that have particular eating patterns are more likely to spread diseases that are unique to their host. By moving diseases from reservoir hosts to other vulnerable hosts, generalist feeders are essential in the spread of zoonotic illnesses [71]. They serve as bridge vectors, allowing illnesses to move between other species. This emphasises how important they are to the epidemiology of zoonotic diseases. The capacity of various hosts to contract and transfer diseases to vectors varies, and the presence of several hosts may provide a dilution effect. The variety of hosts in these conditions can lower the total risk of disease transmission to vectors. This suggests that fewer skilled hosts reduce the likelihood that highly skilled hosts would contract the infection, thereby reducing the risk to humans [68]. Low competent hosts therefore serve as a preventive measure, lowering the total risk of human infections.

4.2 Feeding and Biting Behaviour

The adult *Aedes* is day biting mosquitoes, exhibiting both endophilic and exophilic feeding behavior during the early or late hours of the day [80]. They often bite and rest outdoors before and after feeding [81]. In the dry or wet seasons, most of the mosquitoes bite outdoors. *Aedes* species are often found biting outdoors in larger numbers than indoors [81, 82]. It usually prefers to feed on human, but it can also bite animals like dogs and cattle. Only female *Aedes* bite for completing their oviposition behaviour in order to lay eggs. It bites all day long in general, but it varies in its feeding and biting behaviours depending on the time of day, location, and season.

Ae. aegypti shows bimodal biting behavior in Western Africa [83, 84], with a smaller peak in the morning and a larger peak at sunset [80, 85, 86, 87]. Feeding behavior of *A. aegypti* also showed bimodal pattern, some studies in this context also reveal that *Ae. Aegypti* feed mostly at night [87, 88, 89, 90]. They added that during the dry season, mosquitoes bite more frequently at night, presumably because the lower temperatures during that time of day enable them to fly and eat faster. Nonetheless, there is still uncertainty about mosquito biting behaviour globally. In the afternoon and outside, the risk of being bitten by an *Aedes aegypti* mosquito was highest. In the afternoon, they are more prone to bite [91]. Arboviral infections could result from this with great danger. Similar research conducted in Kenya [92, 93], Trinidad [94], Malaysia [95], and Brazil [96] revealed that year-round, there were more adult *Aedes aegypti* mosquitoes outdoors than indoors. The majority of human-vector contact happens in the afternoon, according to multiple studies that found that more *Aedes aegypti* mosquitoes were captured during this time than in the morning. This observation conflicts with the findings of Strauss *et al*.'s study [97], which revealed no distinct variation in mosquito feeding hours, but it is consistent with the findings of Gouck and Smith's [98] trials. Furthermore, the majority of adult *Aedes aegypti* mosquitoes were recorded outside and in the afternoon in Benin's north [91].

Ae. albopictus feeds mostly during the day, reaching a notable peak in the late afternoon, which is coinside with typical walking hours [99, 100]. These afternoon feeding surges are not as prominent as the morning ones. *Ae. albopictus* has been observed biting in urban residential areas through day, with the hours of early morning and late afternoon to evening being the peak biting times. In urban residential areas, *Ae. albopictus* biting activity decreased from nightfall to dawn. The biting activity of *Ae. albopictus* was constant throughout the day, peaking in the late afternoon and early evening. From late evening until the next morning, there was a decrease in biting activity [100]. According to Marques and Gomes [101], *Ae. albopictus* bites more often during the day, peaking in activity at particular times of the day. It was observed to be peak between 16:00 to 17:00. Moreover, residential areas rich in bushes and other vegetation provide *Ae. albopictus* with perfect places to relax. According to Koehler and Castner [102], *Ae. albopictus* favours shady spots on shrubs that are near the ground. Because it gives *Ae. albopictus* resting places and nectar supplies for feeding on sugar, vegetation is crucial [103, 104]. Que *et al*. [105], state that vegetation has a major impact on the existence of *Ae. albopictus*. Consequently, *Aedes*' habit of resting on the plants next to the sampling site may be the cause of the declined biting activity of *Aedes* from late night to early morning. More recently, it was observed that nocturnal light stimulates *Ae. aegypti* blood feeding habits. It shows that artificial light may be a positive factor in increasing the risk of arboviral diseases transmitted by the biting of the vector, and thus would be an important vital epidemiological importance in understanding the risk of disease transmission [106]. So we have to consider artificial light (light pollution) as one of the important extrinsic factors that regulate the transmission of *Aedes* in metropolitan cities where light pollution is common. Research data on the effect of artificial light on biology of *Aedes* are very limited to date, so all vector biologists should think and survey on it, to generate conclusive data from different parts of the world to make appropriate strategies to control of *Aedes* mosquito.

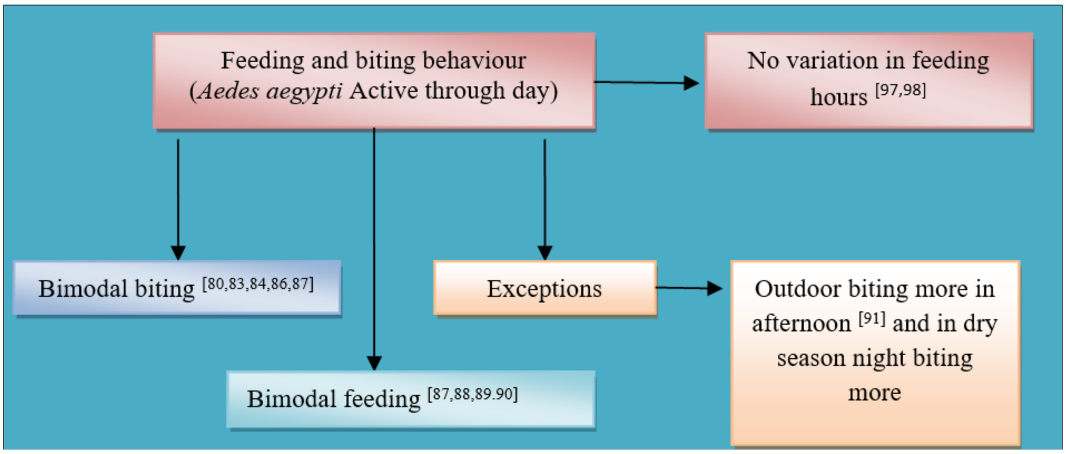

Fig 2: Understanding of feeding and biting behavior of *Aedes aegypti*

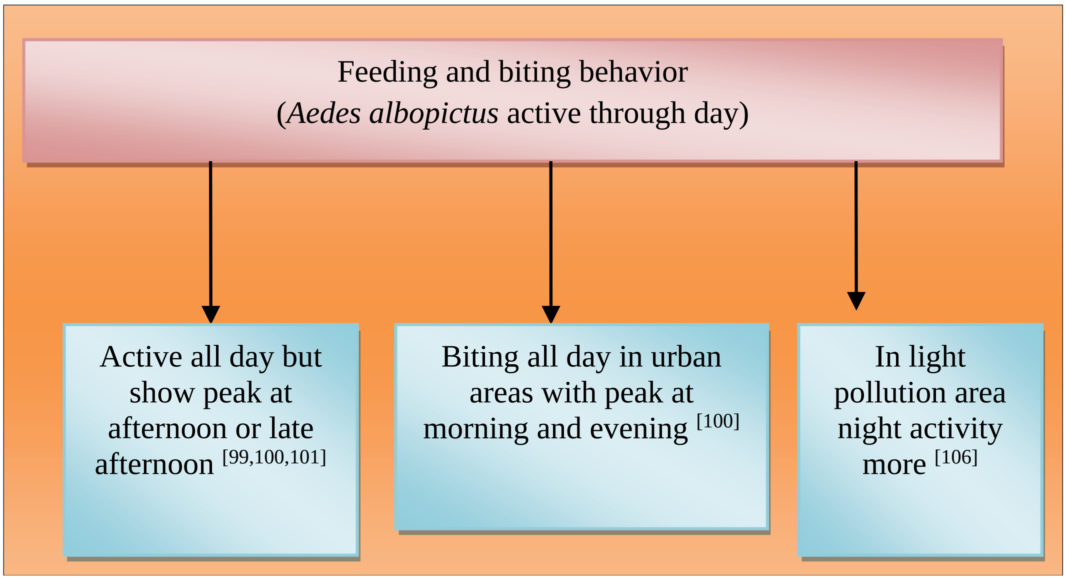

Fig 3: Understanding of feeding and biting behavior of *Aedes albopictus*

Here it is observed that *Aedes aegypti* has different feeding and biting activity hours (morning and afternoon). But it also has some exceptions, as shown in Figure 2. Whereas *Aedes albopictus* is active throughout the day, it is confirmed by so many workers that the feeding and biting behaviour of this species alters more according to artificial and natural environmental conditions as compared to *Aedes aegypti*, as shown in Figure 3. To date, we know little about the feeding and biting behaviour of *Aedes albopictus* as compared to *Aedes aegypti*. Both are day-biting mosquitoes but have different peaks for biting. In this context, some questions are unanswered regarding the feeding and biting behaviour of *Aedes*. It needs more investigation around the world in different topographical areas.

4.3 Resting behavior

Ae. aegypti is generally thought to be extremely attracted to humans and prefer to feed and rest indoors in many regions of the world [107–110]. But according to other investigations, they might also take a rest outside in dim, shaded places close to its breeding grounds [111]. *Aedes aegypti* is called an endophilic species that rests nearly solely on internal human habitations [112,113]. They can be seen resting outside in discarded tyres and bricks, which serve as breeding grounds. As a result, it's critical to take into account bricks and old tyres as possible *Ae. aegypti* breeding grounds and resting places [40]. The study conducted by Manzanilla F *et al*. [112] found that bedrooms, living rooms, bathrooms, and kitchens were *Ae. aegypti*'s main resting places. Furthermore, a considerable proportion of adult *Ae. aegypti* were seen to be resting below 1.5 metres in height, with over 80% of them doing so. Over 90% of all specimens of *Ae. aegypti* collected were shown to have rested indoors, particularly on hanging objects, in a prior study conducted in Thailand [114]. Research in Panama, where homes are more confined and constructed of concrete than raised, timber dwellings in Thailand, showed that *Ae. aegypti* perches on items as well as walls. A significant proportion of mature mosquitoes, between 57% and 64%, were discovered to be at rest below one metre, mostly indoors in bedrooms, on materials including cloth, wood and cement [115]. Data from Iquitos, Peru, showed similar evidence of mosquitoes resting at low altitudes [115]. In addition, mosquito resting preferences are influenced by a variety of fabric variables, including weave, thread count, size, and visual qualities. This pattern of behaviour is also confirmed by observational investigations conducted in Thai experimental huts [116]. In Panama City, the resting habits of adult *Aedes aegypti* were examined, both sexes were mostly found in bedrooms, living rooms, and bathrooms, where the majority of *Ae. aegypti* rested away from the street [109]. This study discovered several features of the resting behaviour of *Ae. aegypti* and related environmental influences [109]. It has been discovered that female *Ae. aegypti* mosquitoes prefer to repose at moderate heights in bathrooms and bedrooms. Though less frequently in bathrooms, similar patterns were noted in Trinidad, Mexico, and Panama, where female *Ae. aegypti* was mostly found resting in bedrooms [117]. But resting preference of *Aedes* inside the house was affected by several factors. The house construction plans are different worldwide, so general theory may not be applicable. In the study of Bhattacharya *et al*.; more number of *Aedes* mosquitoes was collected in huts than in both concrete houses and multi-storey buildings [118]. Lower elevations usually have less light and airflow than areas close to the ceiling, which are frequently lit by light bulbs. Furthermore, ceiling fans might prevent mosquitoes from resting. Lower portions are frequently furnished with hanging items, clothing, towels, and furniture, which creates dark, protected spaces that are perfect for digestion and rest [113]. Mosquitoes often perch on hanging things or are drawn to old clothing that smells like people [114]. In *Aedes* mosquitoes, the intrinsic variables controlling cyclical oviposition are primarily regulated by the length of light. In *Aedes* mosquitoes, physiological mechanisms controlling cyclical oviposition are significantly influenced by light duration [119]. Considering that living rooms are usually the ones closest to the outside, this could help to explain why there seems to be a concentration of *Ae. aegypti* there in the afternoons. Living rooms may have a higher concentration of *Ae. aegypti* in the afternoon because of their close closeness to the outside world. *Aedes* species are anthropophagite in nature that is they feed mostly in the dark. They show indoor-outdoor resting behaviour, especially in stationary places like in the furniture of the rooms, utensils in the kitchen, and clothing. *Aedes agypti* exhibits a known preference for the subject with the least view and areas out of the open areas with milky light internal sites mostly, white colour was avoided, and dark-colored objects were preferred by *Aedes* [120, 121].

From the critical study, we conclude that there is no significant principle about the resting behaviour of *Aedes aegypti*, but it can take rest both indoors and outdoors, depending on the indoor and outdoor conditions as well as the environmental conditions. Indoor resting sites are bedrooms, living rooms, bathrooms, kitchens, and so on, where human smell (bedding room and living room) and humidity and dim lighting (bathroom and kitchen) drive these species to particular sites to hide themselves. In an indoor resting condition, they prefer several objects to sit on, like hanging clothes, the back side of a bed, or furniture. Sometimes they may have an intrinsic tendency to choose the type or colour of wall on which they may rest. The outdoor resting site is composed of some artificial containers and natural water-containing containers near its breeding sites. Usually, maximum *Aedes* were recorded and found resting at lower heights from the ground. To date, very scanty data is available regarding the resting behaviour of *Aedes albopictus*. It shows we have less information regarding the resting behaviours of these two mosquito species. It needs intensive investigation into the resting behaviours of *Aedes*.

5. Conclusion

From this review, it is clear that there are great variations in the feeding, biting and resting behaviours of *Aedes* in different geographic areas and different seasons for which little is known. There is either a lack of proper research methodologies, authentic data from different geographic areas, or proper verification of data in bona fide publishing. Here we also feel that most of the data available is from Africa and very less and old data from other continents of the world. Feeding, biting and resting behaviors of *Aedes* are regulated by several ecological factors, local surroundings like colour of background, intensity and colour of light, types of hosts, types of vectors, duration of day and night and so on. The observations made in this study conclude that there is a need for, proper verification of the ecology and behaviour of the concerned vectors, and more dedicated research which needs consideration of multiple factors in multiple geographic areas to assess behaviour of *Aedes* that influence at least one behavior of *Aedes*. More research is needed to determine whether *Aedes* mosquitoes prefer to feed indoors or outside. To fully understand *Aedes* mosquitoes' preference for indoor or outside feeding, more research is required.

References

1. Service MW. *Mosquitoes (Culicidae)*. In: Medical insects and arachnids. Dordrecht: Springer Netherlands; c1993. p. 120-240.
2. Egid BR, *et al*. Review of the ecology and behaviour of *Aedes aegypti* and *Aedes albopictus* in Western Africa and implications for vector control. Current research in parasitology & vector-borne diseases. 2022;2:100074.
3. Seang-arwut C, *et al*. Indoor resting behavior of *Aedes aegypti* and *Culex spp.* (Diptera: Culicidae) in northeastern Thailand; c2023.
4. Zeng Z, *et al*. Global, regional, and national dengue burden from 1990 to 2017: A systematic analysis based on the global burden of disease study 2017. E-Clinical Medicine, 2021, 32.
5. Idriani E, Martya Rahmaniati M, Rico Kurniawan. Dengue Surveillance Information System: An Android-Based Early Warning System for the Outbreak of Dengue in Padang, Indonesia. Indian Journal of Public Health Research & Development, 2019, 10(5).
6. Paupy C, *et al*. *Aedes albopictus*, an arbovirus vector: from the darkness to the light. Microbes and infection. 2009;11(14-15):1177-1185.
7. Vasilakis N, *et al*. Fever from the forest: prospects for the continued emergence of sylvatic dengue virus and its impact on public health. Nature Reviews Microbiology. 2011;9(7):532-541.
8. Weaver SC, Forrester NL. Chikungunya: Evolutionary history and recent epidemic spread. Antiviral research. 2015;120:32-39.
9. Grard G, *et al*. Zika virus in Gabon (Central Africa) - 2007: A new threat from *Aedes albopictus*? PLoS neglected tropical diseases. 2014;8(2):e2681.
10. Chan YC, Ho BC, Chan KL. *Aedes aegypti* (L.) and *Aedes albopictus* (Skuse) in Singapore City: 5. Observations in relation to dengue haemorrhagic fever. Bulletin of the World Health Organization. 1971;44(5):651.
11. Chareonviriyaphap T, Aum-Aung B, Ratanatham S. Current insecticide resistance patterns in mosquito vectors in Thailand. Southeast Asian Journal of Tropical Medicine and Public Health. 1999;30:184-194.
12. Hawley WA. The biology of *Aedes albopictus*. Journal of the American Mosquito Control Association. 1988;1:31-39.
13. Smith CEG. The history of dengue in tropical Asia and its probable relationship to the mosquito *Aedes aegypti*. Journal of tropical medicine and hygiene. 1956;59(10):243-251.
14. Pant CP, Self LS. Vector ecology and bionomics. Monograph on Dengue/Dengue Haemorrhagic Fever. WHO Reg. Publ. SEARO. 1999;22:121-38.
15. Gratz NG. Critical review of the vector status of *Aedes albopictus*. Medical and veterinary entomology. 2004;18(3):215-227.
16. Mitchell CJ. Geographic spread of *Aedes albopictus* and potential for involvement in arbovirus cycles in the Mediterranean basin. Journal of vector ecology. 1995;20(1):44-58.
17. Miller BR, Ballinger ME. *Aedes albopictus* mosquitoes introduced into Brazil: vector competence for yellow fever and dengue viruses; c1988. p. 476-477.
18. Rodhain F. *Aedes albopictus*: A potential problem in France. Parassitologia. 1995;37(2-3):115-119.
19. Gould DJ, *et al*. An insular outbreak of dengue hemorrhagic fever. III. Identification of vectors and observations on vector ecology. American journal of tropical medicine and hygiene. 1968;17(4):609-618.
20. Facchinelli L, Badolo A, McCall PJ. Biology and Behaviour of *Aedes aegypti* in the Human Environment: Opportunities for Vector Control of Arbovirus Transmission. Viruses. 2023;15(3):636.
21. Powell JR, Tabachnick WJ. History of domestication and spread of *Aedes aegypti*: A review. Memórias do Instituto Oswaldo Cruz. 2013;108:11-17.
22. Gloria-Soria A, *et al*. Global genetic diversity of *Aedes*

aegypti. Molecular ecology. 2016;25(21):5377-5395.

23. Crawford JE, *et al*. Population genomics reveals that an anthropophilic population of *Aedes aegypti* mosquitoes in West Africa recently gave rise to American and Asian populations of this major disease vector. BMC biology. 2017;15:11-16.
24. Rose NH, *et al*. Climate and urbanization drive mosquito preference for humans. Current Biology. 2020;30(18):3570-3579.
25. Aubry F, *et al*. Enhanced Zika virus susceptibility of globally invasive *Aedes aegypti* populations. Science. 2020;370(6519):991-996.
26. Rose NH, *et al*. Enhanced mosquito vectorial capacity underlies the Cape Verde Zika epidemic. PLoS biology. 2022;20(10):e3001864.
27. Dickson LB, *et al*. Vector competence in West African *Aedes aegypti* is flavivirus species and genotype dependent. PLoS neglected tropical diseases. 2014;8(10):e3153.
28. Sylla M, *et al*. Gene flow, subspecies composition, and dengue virus-2 susceptibility among *Aedes aegypti* collections in Senegal. PLoS neglected tropical diseases. 2009;3(4):e408.
29. Futami K, *et al*. Geographical distribution of *Aedes aegypti aegypti* and *Aedes aegypti formosus* (Diptera: Culicidae) in Kenya and environmental factors related to their relative abundance. Journal of Medical Entomology. 2020;57(3):772-779.
30. Rose NH, *et al*. Dating the origin and spread of specialization on human hosts in *Aedes aegypti* mosquitoes. Elife. 2023;12:e83524.
31. Brown JE, *et al*. Worldwide patterns of genetic differentiation imply multiple ‘domestications’ of *Aedes aegypti*, a major vector of human diseases. Proceedings of the Royal Society B: Biological Sciences. 2011;278(1717):2446-2454.
32. Gubler DJ. Dengue, urbanization and globalization: the unholy trinity of the 21st century. Tropical medicine and health. 2011;39(4SUP):S3-S11.
33. Braack L, *et al*. Mosquito-borne arboviruses of African origin: review of key viruses and vectors. Parasites & vectors. 2018;11:21-26.
34. Ryan SJ, *et al*. Global expansion and redistribution of *Aedes*-borne virus transmission risk with climate change. PLoS neglected tropical diseases. 2019;13(3):e0007213.
35. Reinhold JM, Lazzari CR, Lahondère C. Effects of the environmental temperature on *Aedes aegypti* and *Aedes albopictus* mosquitoes: a review. Insects. 2018;9(4):158.
36. Qasim M, Naeem M, Bodlah I. Mosquito (Diptera: Culicidae) of Murree Hills, Punjab, Pakistan. Pakistan Journal of Zoology, 2014, 46(2).
37. Mordecai EA, *et al*. Detecting the impact of temperature on transmission of Zika, dengue, and chikungunya using mechanistic models. PLoS neglected tropical diseases. 2017;11(4):e0005568.
38. Ryan SJ, *et al*. Global expansion and redistribution of *Aedes*-borne virus transmission risk with climate change. PLoS neglected tropical diseases. 2019;13(3):e0007213.
39. Kuna A, Gajewski M, Biernat B. Selected arboviral diseases imported to Poland-current state of knowledge and perspectives for research. Annals of Agricultural and Environmental Medicine, 2019, 26(3).
40. Diallo D, Diallo M. Resting behavior of *Aedes aegypti* in southeastern Senegal. Parasites & Vectors, 2020, 13.
41. Takken W, Verhulst NO. Host preferences of blood-feeding mosquitoes. Annual Review of Entomology. 2013;58:433-453.
42. Harrington LC, Edman JD, Scott TW, *et al*. Influence of container size, location, and time of day on oviposition patterns of the dengue vector, *Aedes aegypti*, in Thailand. Vector-Borne and Zoonotic Diseases. 2008;8(3):415-424.
43. Iwamura T, Guzman-Holst A, Murray KA. Accelerating invasion potential of disease vector *Aedes aegypti* under climate change. Nature Communications. 2020;11(1):2130.
44. Higgs S, Vanlandingham D. Chikungunya virus and its mosquito vectors. Vector-Borne and Zoonotic Diseases. 2015;15(4):231-240.
45. Bhatt S, Gething PW, Brady OJ, *et al*. The global distribution and burden of dengue. Nature. 2013;496(7446):504-507.
46. Baud D, Gubler DJ, Schaub B, Lanteri MC, Musso D. An update on Zika virus infection. The Lancet. 2017;390(10107):2099-2109.
47. Paules CI, Fauci AS. Yellow fever - once again on the radar screen in the Americas. New England Journal of Medicine. 2017;376(15):1397-1399.
48. Chippaux JP, Chippaux A. Yellow fever in Africa and the Americas: a historical and epidemiological perspective. Journal of Venomous Animals and Toxins including Tropical Diseases. 2018;24:20.
49. IuV Iunicheva, Strochkova LS, Danishevskaya ON, *et al*. First evidence for breeding *Aedes aegypti* L in the area of Greater Sochi and in some towns of Abkhasia. Meditsinskaia Parazitologiia i Parazitarnye Bolezni. 2008;(3):40-43.
50. Almeida APG, Gonçalves Y, Novo M, Sousa C, Melim M, Grácio AJ. Vector monitoring of *Aedes aegypti* in the Autonomous Region of Madeira, Portugal. Weekly releases (1997–2007). 2007;12(46):3311.
51. Lima A, Lovin DD, Hickner PV, *et al*. Evidence for an overwintering population of *Aedes aegypti* in Capitol Hill neighborhood, Washington, DC. The American Journal of Tropical Medicine and Hygiene. 2016;94(1):231.
52. De Majo MS, Montini P, Fischer S. Egg hatching and survival of immature stages of *Aedes aegypti* (Diptera: Culicidae) under natural temperature conditions during the cold season in Buenos Aires, Argentina. Journal of Medical Entomology. 2017;54(1):106-113.
53. Giordano BV, Gaspe MS, Bruzzone OA, *et al*. Discovery of an *Aedes (Stegomyia) albopictus* population and first records of *Aedes (Stegomyia) aegypti* in Canada. Medical and Veterinary Entomology. 2020;34(1):10-16.
54. Kampen H, Werner D. Indoor development of *Aedes aegypti* in Germany, 2016. Eurosurveillance. 2016;21(47):30407.
55. Higa Y. Dengue vectors and their spatial distribution. Tropical Medicine and Health. 2011;39:S17-S27.
56. Saifur RG, Hassan AA, Dieng H, *et al*. Changing domesticity of *Aedes aegypti* in northern peninsular Malaysia: reproductive consequences and potential epidemiological implications. PLoS One. 2012;7(2):e30919.
57. Leisnham PT, LaDeau SL, Juliano SA. Spatial and temporal habitat segregation of mosquitoes in urban Florida. PLoS One. 2014;9(3):e91655.

58. Hertz JT, Lyaruu LJ, Ooi EE, *et al*. Distribution of *Aedes* mosquitoes in the Kilimanjaro Region of northern Tanzania. Pathogens and Global Health. 2016;110(3):108-112.
59. Yalwala S, Clark J, Oullo D, Ngonga D, Abuom D, Wanja E. Comparative efficacy of existing surveillance tools for *Aedes aegypti* in Western Kenya. Journal of Vector Ecology. 2015;40(2):301-307.
60. Giordano BV, Gaspe MS, Bruzzone OA, *et al*. Discovery of an *Aedes (Stegomyia) albopictus* population and first records of *Aedes (Stegomyia) aegypti* in Canada. Medical and Veterinary Entomology. 2020;34(1):10-16.
61. Edman JD, Scott TW, Costero A, Morrison AC, Harrington LC, Clark GG. Female *Aedes aegypti* (Diptera: Culicidae) in Thailand rarely feed on sugar. Journal of Medical Entomology. 1992;29(6):1035-1038.
62. Costero A, Edman JD, Clark GG, Scott TW. Life table study of *Aedes aegypti* (Diptera: Culicidae) in Puerto Rico fed only human blood versus blood plus sugar. Journal of Medical Entomology. 1998;35(5):809-813.
63. Harrington LC, Edman JD, Scott TW. Why do female *Aedes aegypti* (Diptera: Culicidae) feed preferentially and frequently on human blood? Journal of Medical Entomology. 2001;38(3):411-422.
64. Handel E van, Wullschleger B, Scampavia L, *et al*. Plant-sugar glycogen, and lipid assay of *Aedes aegypti* collected in urban Puerto Rico and rural Florida. Journal of Medical Entomology; c1994. p. 149-153.
65. Kamgang B, Nchoutpouen E, Simard F, Paupy C. Notes on the blood-feeding behavior of *Aedes albopictus* (Diptera: Culicidae). Parasites & Vectors. 2012;5:01-04.
66. Melgarejo-Colmenares K, Cardo MV, Vezzani D. Blood feeding habits of mosquitoes: hardly a bite in South America. Parasitology Research. 2022;121(7):1829-1852.
67. Fikrig K, Harrington LC. Understanding and interpreting mosquito blood feeding studies: the case of *Aedes albopictus*. Trends in Parasitology. 2021;37(11):959-975.
68. Schmidt KA, Ostfeld RS. Biodiversity and the dilution effect in disease ecology. Ecology. 2001;82(3):609-619.
69. Lyimo IN, Ferguson HM. Ecological and evolutionary determinants of host species choice in mosquito vectors. Trends in Parasitology. 2009;25(4):189-196.
70. Egas M, Dieckmann U, Sabelis MW. Evolution restricts the coexistence of specialists and generalists: the role of trade-off structure. The American Naturalist. 2004;163(4):518-531.
71. Burkett-Cadena ND, Bingham AM, Hunt B, *et al*. Innate preference or opportunism: mosquitoes feeding on birds of prey at the Southeastern Raptor Center. Journal of Vector Ecology. 2014;39(1):21-31.
72. Ulloa García A, Paredes-Espinosa Á, Mendoza-Camacho F, *et al*. Innate host selection in *Anopheles vestitipennis* from southern Mexico. Journal of the American Mosquito Control Association. 2004;20(4):337-341.
73. Lee JJ, Klowden MJ. A male accessory gland protein that modulates female mosquito (*Diptera: Culicidae*) host-seeking behavior. Journal of the American Mosquito Control Association-Mosquito News. 1999;15(1):04-07.
74. Fernandez NM, Klowden MJ. Male accessory gland substances modify the host-seeking behavior of gravid *Aedes aegypti* mosquitoes. Journal of Insect Physiology. 1995;41(11):965-970.
75. Clements AN. The biology of mosquitoes. Volume 2: sensory reception and behaviour. Chapman & Hall; 1999.
76. Stephenson EB, Murphy A, Latham J, *et al*. Interpreting mosquito feeding patterns in Australia through an ecological lens: an analysis of blood meal studies. Parasites & Vectors. 2019;12:1-11.
77. Kilpatrick AM, Kramer LD, Jones MJ, *et al*. West Nile virus epidemics in North America are driven by shifts in mosquito feeding behavior. PLoS Biology. 2006;4(4):e82.
78. Simpson JE, Folsom-O'Keefe CM, Childs JE, *et al*. Vector host-feeding preferences drive transmission of multi-host pathogens: West Nile virus as a model system. Proceedings of the Royal Society B: Biological Sciences. 2012;279(1730):925-933.
79. Corbet PS. Facultative autogeny in arctic mosquitoes. Nature. 1967;215(5101):662-663.
80. Captain-Esoah M, Baffour-Awuah S, Afari EA, *et al*. Biting behavior and molecular identification of *Aedes aegypti* (Diptera: Culicidae) subspecies in some selected recent yellow fever outbreak communities in Northern Ghana. Journal of Medical Entomology. 2020;57(4):1239-1245.
81. World Health Organization. Prevention and control of yellow fever in Africa. World Health Organization; c1986.
82. Service MW. The making of a medical entomologist. Annual Review of Entomology. 2010;55:1-17.
83. Trpis M, Hausermann W, Craig GB. Diel periodicity in the landing of *Aedes aegypti* on man. Bulletin of the World Health Organization. 1973;48(5):623.
84. Yee WL, Foster WA. Diel sugar-feeding and host-seeking rhythms in mosquitoes (Diptera: Culicidae) under laboratory conditions. Journal of Medical Entomology. 1992;29(5):784-791.
85. Zahouli JBZ, Koudou BG, Müller P, *et al*. Effect of land-use changes on the abundance, distribution, and host-seeking behavior of *Aedes* arbovirus vectors in oil palm-dominated landscapes, southeastern Côte d'Ivoire. PloS One. 2017;12(12):e0189082.
86. Traoré-Lamizana M, Zeller HG, Mondo M, *et al*. Surveillance for yellow fever virus in eastern Senegal during 1993. Journal of Medical Entomology. 2014;33(5):760-765.
87. Sissoko F, Junnila A, Traoré MM, *et al*. Frequent sugar feeding behavior by *Aedes aegypti* in Bamako, Mali makes them ideal candidates for control with attractive toxic sugar baits (ATSB). PloS One. 2019;14(6):e0214170.
88. Diarrassouba S, Dossou-Yovo J. Atypical activity rhythm in *Aedes aegypti* in a sub-Sudanian savannah zone of Côte d'Ivoire. Bulletin de la Societe de Pathologie Exotique (1990). 1997;90(5):361-363.
89. Adeleke MA, Mafiana CF, Idowu AB, Sam-Wobo SO, Idowu OA. Population dynamics of indoor sampled mosquitoes and their implication in disease transmission in Abeokuta, south-western Nigeria. Journal of Vector Borne Diseases. 2010;47(1):33-38.
90. Labbo R, Fati AS, Garba I, *et al*. Distribution and relative densities of *Aedes aegypti* in Niger. Médecine et Santé Tropicales. 2019;29(1):47-54.
91. Aïkpon R, Agossa FR, Ossè RA, *et al*. Assessment of population dynamics and biting trends of *Aedes aegypti* in northern Benin: Public health implications; c2019. p.

19-23.

92. Tainchum K, Kongmee M, Manguin S, *et al*. Comparison of *Aedes aegypti* (Diptera: Culicidae) resting behavior on two fabric types under consideration for insecticide treatment in a push-pull strategy. Journal of Medical Entomology. 2013;50(1):59-68.
93. Lutomiah J, Barrera R, Makio A, *et al*. Dengue outbreak in Mombasa city, Kenya, 2013–2014: entomologic investigations. PLoS Neglected Tropical Diseases. 2016;10(10):e0004981.
94. Chadee DD, Martinez R. Landing periodicity of *Aedes aegypti* with implications for dengue transmission in Trinidad, West Indies. Journal of Vector Ecology. 2000;25(2):158-163.
95. Wan-Norafikah O, Nazni WA, Lee HL, *et al*. Distribution of *Aedes* mosquitoes in three selected localities in Malaysia. Sains Malaysiana. 2012;41(10):1309-1313.
96. Fávaro EA, Dibo MR, Mondini A, *et al*. Physiological state of *Aedes* (*Stegomyia*) *aegypti* mosquitoes captured with MosquiTRAPs™ in Mirassol, São Paulo, Brazil. Journal of Vector Ecology. 2006;31(2):285-291.
97. Strauss WG, Whisler HC, Bode WE. Observations on biting behavior of *Aedes aegypti* (L.). Mosquito News. 1965;25(3).
98. Gouck HK, Smith CN. The effect of age and time of day on the avidity of *Aedes aegypti*. Florida Entomologist. 1962:93-94.
99. Muktar Y, Tamerat N, Shewafera A. *Aedes aegypti* as a Vector of Flavivirus. J Trop. Dis. 2016;4(223):2.
100. Chen CD, Lee HL, Liew C, *et al*. Biting behavior of Malaysian mosquitoes, *Aedes albopictus* Skuse, *Armigeres kesseli* Ramalingam, *Culex quinquefasciatus* Say, and *Culex vishnui* Theobald obtained from urban residential areas in Kuala Lumpur. Asian Biomedicine. 2014;8(3):315-321.
101. Marques GRA, Gomes A de C. Anthropophilic behaviour of *Aedes albopictus* (Skuse) (Diptera: Culicidae) in the Vale do Paraíba region, Southeastern Brazil. Revista de Saude Publica. 1997;31:125-130.
102. Koehler PG, Castner JL. Blood sucking insects. EDIS. 1997.
103. Braks MAH, Honorio NA, Lourenço-de-Oliveira R, *et al*. Interspecific competition between two invasive species of container mosquitoes, *Aedes aegypti* and *Aedes albopictus* (Diptera: Culicidae), in Brazil. Annals of the Entomological Society of America. 2004;97(1):130-139.
104. Little E, Bajwa WI, Shaman J. Socio-ecological mechanisms supporting high densities of *Aedes albopictus* (Diptera: Culicidae) in Baltimore, MD. Journal of Medical Entomology. 2017;54(5):1183-1192.
105. Chow CY. *Aedes* mosquito surveillance in the Republic of Vietnam. Southeast Asian Journal of Tropical Medicine and Public Health. 1974;5(4):569-573.
106. Rund SSC, Martinez ME, Scott TW, *et al*. Artificial light at night increases *Aedes aegypti* mosquito biting behavior with implications for arboviral disease transmission. The American Journal of Tropical Medicine and Hygiene. 2020;103(6):2450.
107. Scott TW, Morrison AC, Lorenz LH, *et al*. Longitudinal studies of *Aedes aegypti* (Diptera: Culicidae) in Thailand and Puerto Rico: population dynamics. Journal of Medical Entomology. 2000;37(1):77-88.
108. Pant CP, Yasuno M. Indoor resting sites of *Aedes aegypti* in Bangkok, Thailand. World Health Organization, mimeographed document. WHO/VBC/70.235. 1970.
109. Perich MJ, Kardec A, Braga IA, *et al*. Behavior of resting *Aedes aegypti* (Culicidae: Diptera) and its relation to ultra-low volume adulticide efficacy in Panama City, Panama. Journal of Medical Entomology. 2000;37(4):541-546.
110. Thavara U, Tawatsin A, Chompoosri J, *et al*. Larval occurrence, oviposition behavior and biting activity of potential mosquito vectors of dengue on Samui Island, Thailand. Journal of Vector Ecology. 2001;26:172-180.
111. Schoof HF. Mating, resting habits and dispersal of *Aedes aegypti*. Bulletin of the World Health Organization. 1967;36(4):600.
112. Dzul-Manzanilla F, Huerta H, Che-Mendoza A, *et al*. Indoor resting behavior of *Aedes aegypti* (Diptera: Culicidae) in Acapulco, Mexico. Journal of Medical Entomology. 2017;54(2):501-504.
113. Chadee DD. Resting behaviour of *Aedes aegypti* in Trinidad: with evidence for the re-introduction of indoor residual spraying (IRS) for dengue control. Parasites & Vectors. 2013;6:1-6.
114. Pant CP, Yasuno M. Indoor resting sites of *Aedes aegypti* in Bangkok, Thailand. World Health Organization, mimeographed document. WHO/VBC/70.235. 1970.
115. Vazquez-Prokopec GM, Galvin WA, Kelly R, *et al*. A new, cost-effective, battery-powered aspirator for adult mosquito collections. Journal of Medical Entomology. 2009;46(6):1256-1259.
116. Fukuhara M. Innovation in polyester fibers: from silk-like to new polyester. Textile Research Journal. 1993;63(7):387-391.
117. Tainchum K, Kongmee M, Manguin S, *et al*. Comparison of *Aedes aegypti* (Diptera: Culicidae) resting behavior on two fabric types under consideration for insecticide treatment in a push-pull strategy. Journal of Medical Entomology. 2013;50(1):59-68.
118. Bhattacharya S, Das A, Biswas S, *et al*. Indoor Resting Behaviour of Aedes in Bhawanipatna, Kalahandi, Odisha. Research Journal of Pharmacy and Life Sciences. 2023;4(3):35-44.
119. Becker N, Petric D, Zgomba M, *et al*. Mosquitoes and their control. Springer Science & Business Media. 2010.
120. Panigrahi SK, Dash S, Bhattacharya A. Laboratory evaluation of oviposition behavior of field collected *Aedes* mosquitoes. Journal of Insects. 2014.
121. Marin G, Lucientes J, Marquès E, *et al*. Does colour of ovitrap influence the ovipositional preference of *Aedes aegypti* Linnaeus 1762 (Diptera: Culicidae). Journal of the Mosquito Research Control Association of Australia; c2020. p. 11-15.