Journal Homepage: http://dergipark.gov.tr/ethabd

ETHABD
Erciyes Tarım ve Hayvan Bilimleri Dergisi

DergiPark AKADEMİK

ISSN:2651-5334

The Role Of Insects In Disease Transmission

Araştırma Makalesi/Research Article

Atıf İçin: Almodares, H., Yüksel, E., Imren, M. (2025). Hastalıkların Bulaşmasında Böceklerin Rolü. Erciyes Tarım ve Hayvan Bilimleri Dergisi, 8(1): 140-149
To Cite: Almodares, H., Yüksel, E., Imren, M. (2025). The Role Of Insects In Disease Transmission. Journal of Erciyes Agriculture and Animal Science, 8(1): 140-149

Hisham ALMODARES[1] , Ebubekir YÜKSEL[2] , Mustafa IMREN[3]

[1*]*Erciyes Üniversitesi, Fen Bilimleri Enstitüsü, Kayseri,Türkiye*
[2]*Erciyes Üniversitesi, Ziraat Fakültesi, Bitki Koruma Bölümü, Kayseri/Türkiye*
[3]*Bolu Abant İzzet Baysal Üniversitesi, Bolu Meslek Yüksekokulu, Bolu/Türkiye*
***sorumlu yazar:** Hisam.S.Almodres@aliraqia.edu.iq
Hisham ALMODARES, ORCID No: 0009-0007-2097-1444, Ebubekir YÜKSEL, ORCID No: 0000-0002-6982-5874, Mustafa IMREN, ORCID No: 0000-0002-7217-9092

Yayın Bilgisi

Geliş Tarihi: 27.04.2025
Revizyon Tarihi: 27.04.2025
Kabul Tarihi: 13.06.2025
doi: 10.55257/ethabd.1684877

Anahtar Kelimeler

Vektör kaynaklı hastalıklar, insektisit direnci, mevsimsel göç, iklim değişikliği, çevre kontrolü

Keywords

Vector-borne diseases, insecticide resistance, seasonal migration, climate change, environmental control

Abstract

This study looks at the insects that spread diseases to humans and animals to identify ways to prevent these vectors and treat infections that occur in the environment (Europe, Middle East). Alterations in the environment have also recently played a role development of a few illnesses in outlying regions. It has a significant impact on health systems and puts a burden on the few resources available in many poor nations. The emergence of illnesses transmitted by vectors in previously unaffected areas and simultaneous outbreaks across many countries in the last ten years clearly illustrates the escalating threat these diseases pose to global health worldwide. In tropical regions and elsewhere, vector-borne illnesses are among the leading causes of human mortality and morbidity. Lymphatic filariasis and Chagas disease are among the diseases causing rapid spread, despite significant progress in the fight against malaria and Chagas disease. Turkey faces high risks of European diseases, particularly in agricultural regions, necessitating improved water protection measures to mitigate the spread of these diseases. This research analyzes data for control. Most global diseases are vector-borne. Sometimes controlling the insects that carry these terrible diseases is enough. African trypanosomiasis, caused by Anopheles gambiae, Triatominae, tsetse flies, Glossina spp., and blood-feeding tsetse insects, causes malaria, Chagas, and African sleeping sickness. Genetic research suggests managerial targets. The understanding of Chagas disease epidemiology and improved control data indicate the need for massive malaria control in Africa. Recent A. gambiae population genetic study advances vector biology. Moths are influenced by flight currents and wind, and to reach their goal promptly, they need to drift and adapt to the wind. Moths prefer wind, outperforming songbirds, affecting their migratory abilities, and posing a global public health risk due to vector-bor.

Hastalıkların Bulaşmasında Böceklerin Rolü

Özet

Bu çalışma, insanlara ve hayvanlara hastalık yayan böcekleri inceleyerek, bu vektörleri önlemenin ve çevrede (Avrupa, Orta Doğu) meydana gelen enfeksiyonları tedavi etmenin yollarını belirlemek amacıyla inceliyor. Çevredeki değişikliklerin de kısa süre önce uzak bölgelerdeki bazı hastalıkların gelişmesinde rolü oldu. Sağlık sistemleri üzerinde önemli bir etki yaratıyor ve birçok yoksul ülkede mevcut olan az sayıdaki kaynaklara yük getiriyor. Daha önce etkilenmeyen bölgelerde vektörler yoluyla bulaşan hastalıkların ortaya çıkması ve son on yılda birçok ülkede eş zamanlı salgınların ortaya çıkması, bu hastalıkların dünya çapında küresel sağlığa sağladığı artan tehdidi açıkça göstermektedir. Tropikal bölgelerde ve başka yerlerde vektör kaynaklı hastalıklar, insan ölüm ve hastalık oranlarının önde gelen nedenleri arasındadır. Lenfatik filaryaz ve Chagas hastalığı, sıtma ve Chagas hastalığıyla mücadelede önemli ilerlemeler kaydedilmesine rağmen hızla yayılan hastalıklar arasında yer alıyor. Türkiye, özellikle tarım bölgelerinde Avrupa'daki hastalıklara ilişkin yüksek riskle karşı karşıyadır ve bu hastalıkların yayılmasını azaltmak için gelişmiş su koruma önlemlerini gerektirmektedir. Bu araştırma kontrol için verileri analiz etmektedir. Küresel hastalıkların çoğu vektör kaynaklıdır. Bazen bu korkunç hastalıkları taşıyan böcekleri kontrol altına almak yeterlidir. Anopheles gambiae, Triatominae, çeçe sinekleri, Glossina spp. ve kanla beslenen çeçe böceklerinin neden olduğu Afrika tripanozomiyazı sıtmaya, Chagas'a ve Afrika uyku hastalığına neden olur. Genetik araştırmalar yönetimsel hedefler önerir. Chagas hastalığı epidemiyolojisinin anlaşılması ve gelişmiş kontrol verileri, Afrika'da yoğun sıtma kontrolüne duyulan ihtiyacı göstermektedir. Son zamanlarda yapılan A. gambiae popülasyon genetik çalışması, vektör biyolojisini ilerletmektedir. Güveler uçuş akıntılarından ve rüzgardan etkilenirler ve hedeflerine zamanında ulaşabilmeleri için sürüklenip rüzgara uyum sağlamaları gerekir. Güveler rüzgarı tercih ediyor, ötücü kuşlardan daha iyi performans gösteriyor, göç yeteneklerini etkiliyor ve vektör kaynaklı hastalıklar nedeniyle küresel bir halk sağlığı riski oluşturuyor.

1. INTRODUCTİON

In the last ten years, a number of researchers in the field of academia have put up the hypothesis that social insects might be able to make use of a cognitive map in order to navigate and identify novel pathways within their surroundings. Not only do insects not rely on mental maps for navigation, but they also rely on vectors, images, and landmarks to direct them. This is according to the conclusions of an alternate research study. Research that was conducted not too long ago has provided insight on the strategies that insects employ to traverse their environment. In the first set of findings from the experiment, it was discovered that the navigational capabilities of desert ants are influenced by the interplay between locomotor vectors and compass data or landmark recall. Honeybees may occasionally choose a new path without utilising a mental map by merging vector information from two separate directions, according to the second discovery, which implies that honeybees may do so under certain circumstances (Morin CW, Comrie AC, Ernst K.2013). It is possible that honeybees are capable of doing this, which lends credence to this discovery. The findings go beyond the basic discussion of "map versus non-map" by offering more in-depth explanations of the strategies that insects employ to travel. This research goes beyond the dispute. Because of its strategic location in the heart of all of these regions, Turkey serves as a natural connection between Europe, the Caucasus, Asia, and Africa. The fact that a considerable number of zoonotic diseases have an impact on the epidemiology of public health in the region is noteworthy for reasons that extend beyond the realm of economics(Uyar, Y., & Bakır, E. 2016) . There are two types of diseases that fall under the category of diseases that are spread by arthropods and insects: vector-borne diseases and zoonotic diseases. Within the realm of public health, zoonotic diseases have received a considerable amount of attention in recent years. Snails, ticks, and other hematophagous insects are the agents that are responsible for the transmission of a variety of bacterial, viral, and parasitic illnesses(Kaya, M. 2011,Özbilgin, A., Töz, S., Harman, M., Topal, S. G., Uzun, S., Okudan, F. & Özbel, Y. 2019). These infections ultimately result in the development of vector-borne zoonotic diseases, also known as disease transmission vectors. The likelihood of newly emerging vector-borne zoonotic diseases or the reemergence of pathogens that were previously under control is increased as a result of urbanisation, natural disasters such as tropical cyclones, floods, earthquakes, and tsunamis, as well as human activities such as migration, travel, and international commerce, which are all exacerbated by climate change (Bäckman, J., Reynolds, D. R., & Alerstam, T. 2016). All of these factors contribute to an increase in the likelihood of these diseases occurring. As a result of the evolving climate on a worldwide scale, the environments in which vector arthropods live are becoming increasingly favourable. It is likely that this will make it feasible for illnesses that were previously confined to a particular location to spread to vulnerable animals and humans in places that were not previously afflicted by them. There are a number of factors that influence the reproductive biology, behaviour, population dynamics, and development of illnesses that are transmitted by arthropod vectors. These factors include the conditions of the soil and vegetation, as well as, humidity, and precipitation. Infectious illnesses and the organisms that they infect temperature (both people and animals) are extremely susceptible to change, and it is essential to keep a close check on these changes and develop predictions about how they could affect them(World Health Organization.2012). A comprehensive knowledge of these characteristics and the impact they have on the spread of sickness is essential for the purpose of developing efficient strategies and effectively executing VBDZ control measures. This understanding is necessary for the purpose of building effective tactics. Turkey has been associated with the identification of more than one hundred different types of zoonotic illnesses and pathogens. The following are included in this list: 37 species of bacteria, 13 species of fungi, 29 species of viruses, and 28 species of parasites. Arthropod vectors are responsible for the transmission of 19 of these diseases. A total of twenty-one zoonotic illnesses have been identified by specialists as being among the most hazardous on the European continent(Campbell-Lendrum D, Manga L, Bagayoko M, Sommerfeld J.2015, Little, S. E., & Bowman, D. D. 2013, Marcello N.2020). Determine which VBZDs are the most relevant for the goal of safeguarding the health of the general population in Turkey. There is a possibility that this information may be the impetus for research into novel methods of control and prevention that will be of aid to Turkey and the regions that are next to it. There are a significant

number of insects that migrate from one continent to another on an annual basis; yet, our understanding of the fundamental reasons and mechanisms that are responsible for this phenomena is still lacking. It is primarily for the purpose of increasing the likelihood of successful reproduction that insects are able to move around with their bodies(World Health Organization. 2013, Caminade, C., McIntyre, K. M., & Jones, A. E. 2019, J. W., Nilsson, C., Lim, K. S., Bäckman, J., Reynolds, D. R., & Alerstam, T. 2016). When insects stretch their attempts to mate over a period of time and travel enormous distances, they are able to disseminate their offspring throughout a broad variety of settings. This is possible because insects are able to travel great distances. Specifically, the objective of this research is to illustrate how the study of insect migrations across long distances has the potential to enhance our understanding of migration. There is a possibility that tracking devices might be utilised in order to carry out global surveillance of desert locusts (Chapman, J. W., Nilsson, C., Lim, K. S., Bäckman, J., Reynolds, D. R., & Alerstam, T. 2016, J. W., & Wikelski, M. 2022, Uyar, Y, & Bakır, E. 2016, S. G., Uzun, S., Okudan, F.,& Özbel, Y. 2019).

In view of the fact that bees and ants are able to simultaneously recall two distinct paths, it is of the highest significance to ascertain whether or not they each have a frame of reference that is comparable to one another. In light of the fact that insects possess the ability to acquire and preserve spatial information inside their brain systems, this is certainly something that should be taken into consideration. This particular representation is believed to go beyond the concept of spatial structure since it makes use of compass-guided vectors and routes that are produced by successive photographic memories. According to the notion proposed by Gould, honeybees navigate their environment by utilising an internal model that is composed of geometric links between apparent places in their surroundings. The research that Gould did on the orientation of animals served as a source of inspiration for his idea(Morin CW, Comrie AC, Ernst K.2013).

One million and four hundred thousand individuals lose their lives annually as a result of illnesses transmitted by vectors. This constitutes seventeen percent of the total number of fatalities that are brought on by parasites and viral infections(World Health Organization. 2014). The restriction of insect vectors is likely to be the most effective technique, and in many instances, it may be the only option, when it comes to safeguarding the general population from these potentially lethal diseases. In the meantime, the significant deterioration of the world environment is causing a significant shift in the rates and patterns of diseases transmitted by vectors or insects. The patterns of infection are undergoing a revolution as a result of globalisation and demographic shifts, and these changes are taking place concurrently. In the subject of vector genetics, research helps us get a better understanding of the epidemiology of illnesses that are transmitted by vectors(Githeko, A. K., Ototo, E. N., & Guiyun, Y. 2012). This, in turn, makes it simpler to create effective strategies for the prevention and control of diseases. Discoveries have been made by geneticists, including the identification of novel species, subspecies, cryptic species, and imported vectors. In addition to this, they have conducted phylogenetic research on significant species and discovered taxa that are pertinent due to the epidemiological relevance of the species. Researchers in the field of cytogenetics have demonstrated that the evolution of insect vectors is dependent upon the formation of chromosomal structures within the organism. By shedding light on the intricate structure of insect vector populations, geneticists that specialise in population dynamics have successfully accomplished their mission. These capabilities include their habitats, host preferences, natural defences, durability in dry settings, and resistance to pesticides. The development of new substances that are capable of both attracting and repelling vectors will be made easier as a result of this observation. (World Health Organization. 2011).

2. METHODS AND MATERIALS

The polling places were strategically located in locations that highlight a number of diseases that are spread by vectors, including malaria, in order to gather and verify information. This was done in order to ensure that the information collected is accurate. In addition, they collaborated with the authorities who were in charge of providing medical treatment. The allocation of these offices was the responsibility of the World Health Organisation, which is made up of the states that are members of the organization(World Health Organization. 2023). One piece of research was conducted on people who offered their time to take part in activities aimed at controlling vectors. The territories and special zones are the representations of the responses that were offered by the other member

nations who participated in the poll. It was decided that 143 nations, with a total population of 5.49 billion people, would be selected for the selection process. The United States of America, Japan, Canada, and Australia were not included in the survey and hence did not participate. Instead, the poll concentrated on the countries of Armenia, Azerbaijan, Georgia, Kyrgyzstan, Tajikistan, Turkey, Uzbekistan, and Turkmenistan, all of which are located in Europe. There was not a single other nation listed. As a result of this, more nations that were not included in the research need to be explored further since they utilise pesticides for vector management(World Health Organization. 2013, Lindsay, L. R., Ogden, N. H., & Schofield, S. W. 2015). This is very important and should be done in order to minimise the spread of Western influenza throughout the Americas. Additionally. By concentrating on vectors that are located inside of homes, residual spraying is used to cut down on the transmission of dengue fever. This is done in order to limit the disease's spread. Furthermore, "perifocal treatment" is utilised in order to concentrate on areas that are frequented by mosquitoes and sites that are close to this location(Hernández-Triana, L. M., Jeffries, C. L., Mansfield, K. L., Carnell, G., Fooks, A. R., & Johnson, N. 2014, Uyar, Y., & Bakır, E. 2016, Leblebicioglu, H., Ozaras, R., Fletcher, T. E., & Beeching, N. J. 2016). This is done in order to eliminate the mosquito population. Net treatment is the process of applying insecticides to curtains or bed nets, with the exception of long-lasting nets that are manufactured expressly for the purpose of pest management. The term "net treatment" is used to describe the operation. Larvicides are a type of pesticide that are utilised in aquatic environments that are susceptible to mosquitoes and act as breeding grounds for them. these countries were finally eliminated from the analysis. Through the application of a method, the researchers were able to ascertain the amount of residual spraying that was made available to them. Pesticides are measured in square meters by the pesticide business. The number of nations that reported increased from 78 to 92. Due to the fact that this occurred, we made adjustments to the data that we acquired from the consumption rate that was observed all over the world for each year. We created a weighting factor by dividing the total population of all 143 target nations by the data availability rate of the population. This was done using data regarding health that was provided by the World Health Organisation (WHO)(Borja-Cabrera, G. P. 2024, Dodgen, D.& Ziska, L. 2016). With this information, we were able to calculate the weighting factor. With the use of this data, we were able to determine the total human population of each and every one of the nations that took part in the survey on an annual basis.. The use of pesticides in the battle against certain illnesses has Been sanctioned by a significant number of countries throughout the world. The examination of pesticide treatment for each condition is carried out with the help of this multifunctional insecticide, which has a composition of 2% organophosphates and 3% pyrethroids(Marcello N 2020, Center of Disease Control (CDC). 2022c).

2.1 The Use Of Biological Processes For The Purpose Of Control

The biological control of mosquitoes and other vectors often entails the use of parasites, predators, or alternative species. This is implemented to inhibit the transmission of illnesses. In some areas, predatory fish and copepods can inhibit the maturation of Aedes mosquito larvae. Due to the fact that they are very tiny, ornamental fish are frequently utilised in aquariums as an effective predator of larvae. In order to keep one's level of influence over the issue, it is necessary to verify and provide the organisms in question on a consistent basis(Hernández-Triana, L. M., Jeffries, C. L., Mansfield, K. L 2014). The amount of malaria vectors that are present in rice farmlands in Tanzania has been shown to be reduced with the use of this technique, which has been shown to be successful (Center of Disease Control (CDC). 2022d, Romiti, F., Casini, R., Magliano, A.2022).

2.2 Management Of Genetic

The objectives of genetic control techniques are to either prevent the trait from appearing in the populations that are defined by the plan or to incorporate a characteristic that minimises the risk of the trait causing damage. Both of these objectives are achieved via the use of genetic control techniques. An variety of other strategies are now being developed on-site, and the early field trials have demonstrated that the results are positive. The introduction of Wolbachia bacteria and the genetic alteration of mosquitoes in order to prevent their reproduction are examples of treatments that fall within this category. Studies conducted by other researchers have demonstrated that mosquitoes may be modified to reduce their capacity to transmit dengue parasites. It has been effectively completed that this modification was made(World

Health Organization. 2013, Morin CW, Comrie AC, Ernst K.2013).

2.3 The Management Of Waste

There are a number of things that can serve as substantial mosquito breeding grounds, including coconut shells, worn vehicle tires, abandoned tins, plastic bottles, and empty drums. The tires that have been thrown away need to be collected, reused, or disposed of in landfills in an acceptable manner. It is possible that asking buyers of new tires to return their old tires would be an effective way to improve the management and disposal of worn tires. With this, the intended outcome would be achieved(Njenga, S. M., Kanyi, H. M., Mutungi, F. M., Okoyo, C., Matendechero, H. S., Pullan, R. L.,& Won, K. Y. 2017)

2.4 Disease

2.4.1 Chagas Disease

Myalgia, fever, lymphadenopathy, pallor, and headache are some of the accompanying symptoms of an infection caused by the Chagas virus. Indicators of Chagas virus infection range from the lack of symptoms to the presence of very severe symptoms. Patients may have discomfort in the abdomen region or the thoracic region, in addition to breathing difficulties and oedema. The first signs that may be observed after being bitten by a triatomine insect are a cutaneous lesion or a purple oedema on one eyelid. These symptoms may be present immediately after the bite. On the other hand, this is true in a far lower percentage of cases than fifty percent. There is a high probability that the sickness may progress to a chronic stage, which will lead to difficulties with the circulatory, digestive, and/or neurological systems. It is possible that the infection would, over the course of time, cause the heart muscle to gradually disintegrate, which might ultimately lead to sudden death or cardiac failure. Both benznidazole and nifurtimox, which are both antiparasitic drugs, have the potential to be successful treatments if they are administered as soon as possible after infection. The Chagas disease vaccine is not now available for use in the prevention of the illness(Boubaker, R., Meige, P., Mialet, C., Ngarambe Buffat, C., Uwanyiligira, M., Widmer, F.,& D'Acremont, V. 2016,Mahyoub JA, Rehman H, Saggu S, Murugan K, Panneerselvam C, Alrefaei MSS,2016, Center of Disease Control (CDC). 2022d.).

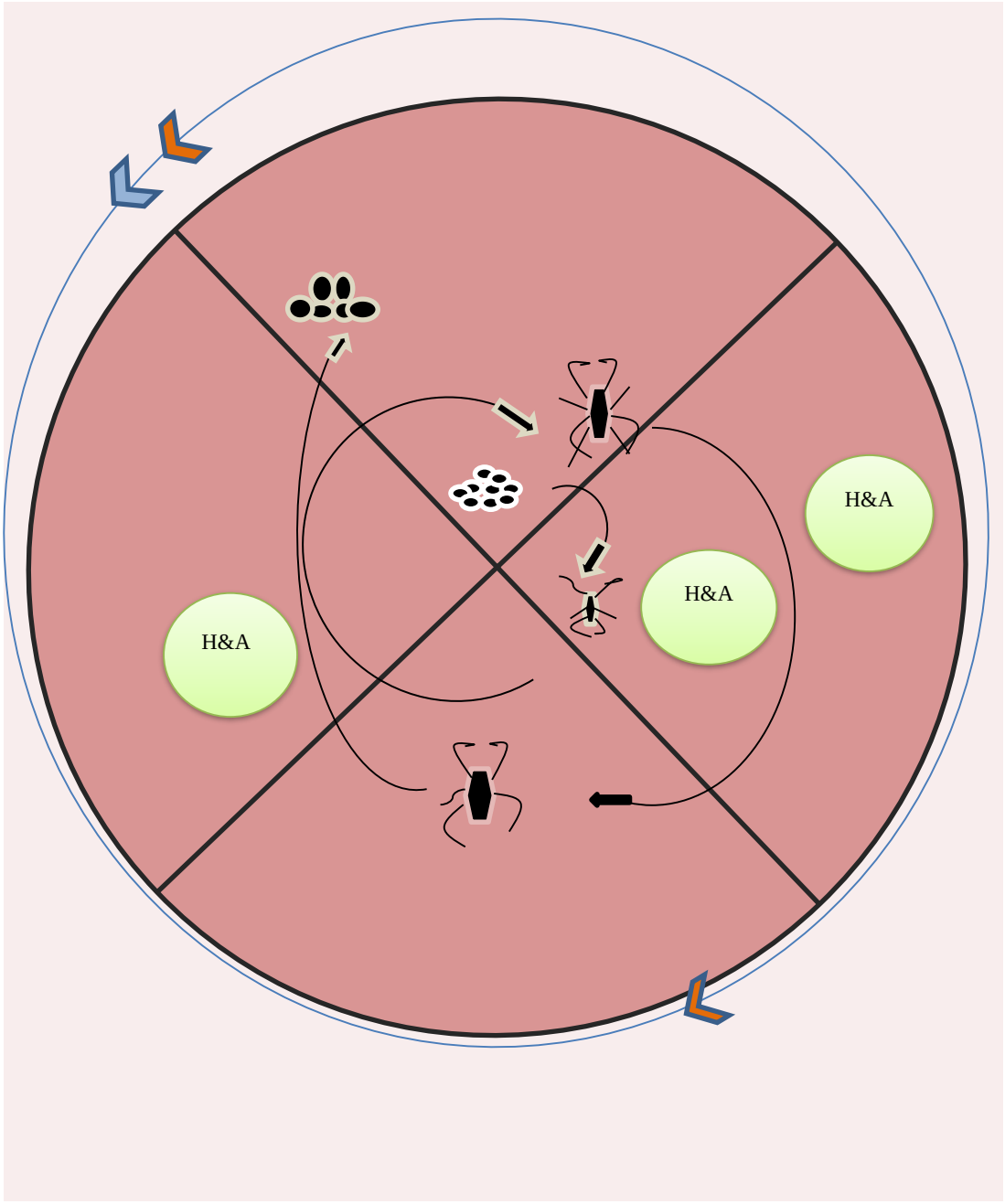
2.4.2 Schistosomiasis (Bilharzia)

Schiztosomiasis is a persistent form of the illness. There are a number of symptoms that can be associated with intestinal schistosomiasis, some of which include stomach pain, diarrhoea, hematochezia, and hepatosplenomegaly. Fluid accumulation in the peritoneal cavity, abdominal vascular hypertension, and abdominal expansion are some of the symptoms that are associated with this illness. Schistosomiasis that affects the urinary system can cause a wide range of symptoms, including haematuria, lesions and fibrosis in the genital region, bladder, and ureters, renal failure, and, in extremely rare instances, bladder cancer. The outcome may be unfavourable due to the fact that it increases the likelihood of HIV infection in females and adds to the development of infertility(Leblebicioglu, H., Ozaras, R., Fletcher, T. E., & Beeching, N. J. 2016., Grácio, A. D. S., & Grácio, M. A. A. 2017,Rocklöv J, Dubrow R 2020).

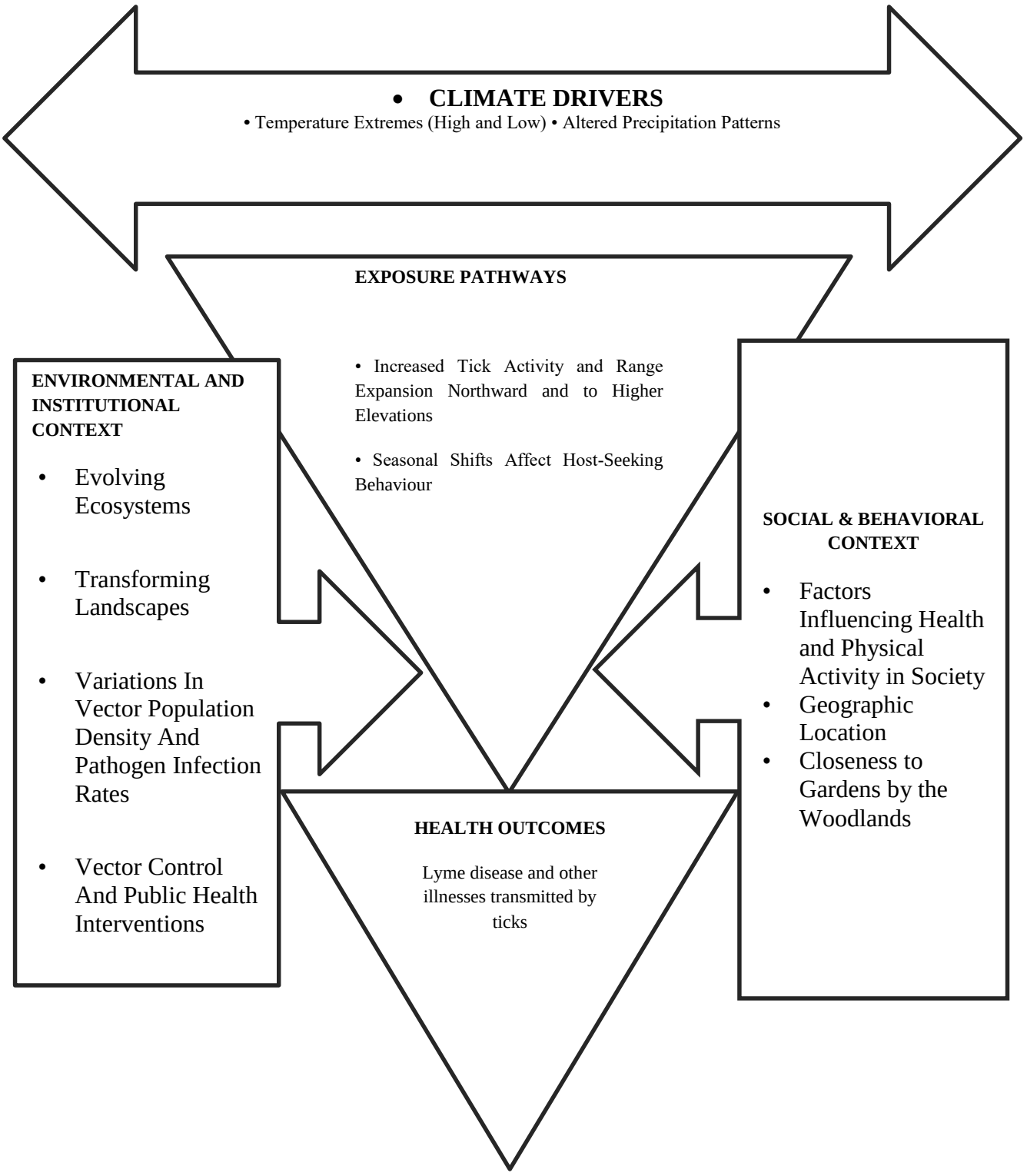
2.4.3 Malaria

Malaria caused by parasites can cause physical signs such as fever, chills, and symptoms similar to those of influenza. In the majority of cases, symptoms do not appear until at least seven days after the infection has occurredMitigate the transmission of disease via mosquito bites. Male Anopheles mosquitoes transmit Plasmodium parasites, the causative agents of malaria. Both the identification and treatment of malaria in a timely manner are essential. In the event that the disease is not addressed, it has the potential to cause considerable morbidity and death. Among the treatments available for Plasmodium falciparum malaria, the combination therapy that is based on artemisinin is particularly effective. There is presently no malaria vaccine that is ready for commercial use, despite the fact that seven African countries are taking part in a big clinical research to create a vaccine against P. Falciparum (Githeko, A. K., Ototo, E. N., & Guiyun, Y. 2012, Njenga, S. M., Kanyi, H. M., Mutungi, F. M., Okoyo, C., Matendechero, H. S, Pullan, R. L., & Won, K. Y. 2017., Layton, D. S., Choudhary, A., & Bean, A. G. 2017).

THE LIFE CYCLE OF IXODES SCAPULARIS, THE BLACKLEGGED TICK



(H) Human, (A) Animal, ● Eggs,(Crimmins, A., Balbus, J., Gamble, J. L., Beard, C. B., Bell, J. E., Dodgen, D.& Ziska, L. 2016)



CLIMATE CHANGE AND HEALTH LYME DISEASE (Crimmins, A., Balbus, J., Gamble, J. L., Beard, C. B., Bell, J. E., Dodgen, D.& Ziska, L. 2016)

3. DISCUSSION AND CONCLUSION

The delicate interaction between winds and animal mobility, particularly among flight-dependent species such as songbirds, demonstrates the considerable problems these animals confront when climatic circumstances change. While winds may drive birds to new heights, they can also deflect migratory pathways and impair their ability to navigate properly. In contrast, the rise of vector-borne illnesses highlights a significant global health concern connected to shifting climate patterns, with tropical disorders impacting communities all over the globe. Strategies for reducing these consequences, such as using wind flow to optimise migratory patterns, are critical for maintaining biodiversity and responding effectively to rising health problems. Together, our awareness of wind's varied effect on animal movement and the worrisome development of illnesses need immediate attention and novel solutions in our approach to environmental protection and public health (Menz, M. H., Scacco, M., Bürki-Spycher, H. M., Williams, H. J., Reynolds, D. R., Chapman, J. W., & Wikelski, M. 2022). Organochlorines dominated vector control pesticide use (71% of total), whilst pyrethroids dominated surface area serviced (81%). Since the Stockholm Convention went into force, DDT consumption has remained steady globally. India, the world's largest DDT user, had a modest reduction after 2015, but African consumption increased rapidly until 2013 owing to indoor residual spraying operations. Increased pyrethroid use may result in pesticide resistance and reduce the efficacy of LNs, which depend heavily on them. Pyrethroids were utilised to cure a variety of illnesses across the Americas, Africa, and the Western Pacific, with the United States utilising the most in terms of per person. Disease-specific, donor-supported, and agriculture-related pesticide resistance management strategies should be coordinated. As a rational decision-making process, integrated vector control decreases pesticide resistance selection pressure while also ensuring insecticide stewardship throughout time (Njenga, S. M., Kanyi, H. M., Mutungi, F. M., Okoyo, C., Matendechero, H. S., Pullan, R. L.& Won, K. Y. 2017, Christensen AM, Pietralczyk E, Lopez JE, Brooks C, Schriefer ME,2017).

This brief summary discusses Turkish VBZDs. Arthropod vectors transmit 20% of the Turkish public health is impacted by 107 zoonotic bacterial, viral, parasitic, and fungal illnesses. Turkey is at medium risk from climate change, although other places have seen greater weather and climate-related calamities. Vectors have different biological niches in these extreme environments, hence VBZD transmission is epidemiologically relevant. Crimean-Congo leishmaniasis hemorrhagic the flu, a virus that causes West Nile, has been detected in new places. Following the sixth Pan-European global environment outlook assessment, Turkey has set climate change as one of its sustainable development goals. To protect Turkish residents from climate change catastrophes, the Ministry of Health has developed a state-wide policy. To manage VBDZs and reduce emerging risks, the One Health concept includes a multidisciplinary network of target communities, clinicians, veterinarians, and public health officials(Özbilgin, A., Töz, S., Harman, M., Topal, S. G., Uzun, S., Okudan, F.& Özbel, Y. 2019). We can increase risk factor awareness and implement the most effective vector-borne zoonotic disease management and prevention strategies. According to One Health, experts from all disciplines should conduct cutting-edge research to eradicate VBZDs. VBZDs may be regulated and avoided via global and regional coordination. Responsible parties should perform periodic surveys in both endemic and non-endemic regions to evaluate vector and pathogen increases caused by human and animal migration. Our work supports a multidisciplinary regional strategy based on the One Health Concept to combat zoonotic diseases and the newly proven fatal coronavirus pandemic across borders. Turkey may take the lead in Middle Eastern VBZD control, working with international organisations, authorities, and scholars. Following political and administrative choices, the Turkish Ministry of Health established the "Turkey Zoonotic Diseases National Committee" in 2019. This group is in charge of developing the "Turkey Zoonotic Diseases Action Plan 2019-2023," which educates the public about zoonotic disease prevention and awareness, assesses risks, creates and maintains national diagnostic labs, and updates sickness treatment procedures(World Health Organization. 2023, World malaria report 2023, World Health Organization, Githeko, A. K., Ototo, E. N., & Guiyun, Y. (2012).).

Climate change and migration may spread P. falciparum in non-endemic Turkey and Mediterranean Europe. Gametocytes were found in 22.9% of samples,

and the development of vectors due to climate change increases the likelihood that P. falciparum malaria would spread spontaneously in Turkey and surrounding countries. All visitors to high-risk malaria areas need chemoprophylaxis. Travellers from malaria-endemic areas should prioritise malaria in fever differential diagnosis. Healthcare staff must study travel medicine, particularly malaria, in order to treat returning travellers.

Turkey, which is located on migratory routes that connect two continents to Europe, accounts for about 95% of the worldwide malaria load. Returning travellers may introduce malaria into our nation as a result of adequate vectors, meteorological conditions, and environmental variables. It is worth noting that 30 (22.9%) of the patients had P. falciparum gametocytes, which may infect Anopheles species and cause malaria to spread locally(Njenga, S. M., Kanyi, H. M., Mutungi, F. M., Okoyo, C., Matendechero, H. S., Pullan, R. L.,& Won, K. Y. 2017).

REFERENCES

Boubaker, R., Meige, P., Mialet, C., Ngarambe Buffat, C., Uwanyiligira, M., Widmer, F., ... & D'Acremont, V. (2016). Travellers' profile, travel patterns and vaccine practices—a 10-year prospective study in a Swiss Travel Clinic. Journal of travel medicine, 23(1), tav017.

Caminade, C., McIntyre, K. M., & Jones, A. E. (2019). Impact of recent and future climate change on vector-borne diseases. Annals of the New York Academy of Sciences, 1436(1), 157-173.

Campbell-Lendrum D, Manga L, Bagayoko M, Sommerfeld J. Climate change and vector-borne diseases: What are the implications for public health research and policy? Philosophy Transaction of the Royal Society B. 2015;370:20130552.

Center of Disease Control (CDC). 2022c. St. Louis encephalitis virus. Available at: https://www.cdc.gov/sle/faq/index.html. (Accessed on April 25, 2022).

Center of Disease Control (CDC). 2022d. West Nile dead birds. Available at: https://www.cdc.gov/westnile/dead-birds/index.html. (Accessed on April 25, 2022).

Center of Disease Control (CDC). 2022d. West Nile dead birds. Available at: https://www.cdc.gov/westnile/dead-birds/index.html. (Accessed on April 25, 2022).

Chapman, J. W., Nilsson, C., Lim, K. S., Bäckman, J., Reynolds, D. R., & Alerstam, T. (2016). Adaptive strategies in nocturnally migrating insects and songbirds: contrasting responses to wind. Journal of Animal Ecology, 85(1), 115-124.11 .

Christensen AM, Pietralczyk E, Lopez JE, Brooks C, Schriefer ME, Wozniak E. Diagnosis and management of Borrelia turicatae infection in febrile soldier, Texas, USA. Emerging Infectious Diseases. 2017;23:883-884.

Crimmins, A., Balbus, J., Gamble, J. L., Beard, C. B., Bell, J. E., Dodgen, D., ... & Ziska, L. (2016). The impacts of climate change on human health in the United States: a scientific assessment. The impacts of climate change on human health in the United States: A scientific assessment.

Githeko, A. K., Ototo, E. N., & Guiyun, Y. (2012). Progress towards understanding the ecology and epidemiology of malaria in the western Kenya highlands: opportunities and challenges for control under climate change risk. Acta tropica, 121(1), 19-25.

Grácio, A. D. S., & Grácio, M. A. A. (2017). Plague: a millenary infectious disease reemerging in the XXI century. BioMed research international, 2017(1), 5696542.

Hernández-Triana, L. M., Jeffries, C. L., Mansfield, K. L., Carnell, G., Fooks, A. R., & Johnson, N. (2014). Emergence of West Nile virus lineage 2 in Europe: a review on the introduction and spread of a mosquito-borne disease. Frontiers in public health, 2, 271.

Kaya, M. (2011). Investigation of frequency of babesiosis among human who have tick bite history living in Tatvan region (Doctoral dissertation, Erciyes University).

Layton, D. S., Choudhary, A., & Bean, A. G. (2017). Breaking the chain of zoonoses through biosecurity in livestock. Vaccine, 35(44), 5967-5973.

Leblebicioglu, H., Ozaras, R., Fletcher, T. E., & Beeching, N. J. (2016). Crimean-Congo haemorrhagic fever in travellers: A systematic review. Travel medicine and infectious disease, 14(2), 73-80.

Lindsay, L. R., Ogden, N. H., & Schofield, S. W. (2015). Review of methods to prevent and reduce the risk of Lyme disease. Canada Communicable Disease Report, 41(6), 146.

Little, S. E., & Bowman, D. D. (2013). Vector-borne diseases. Georgis' Parasitology for Veterinarians-E-Book: Georgis' Parasitology for Veterinarians-E-Book, 241.

Mahyoub JA, Rehman H, Saggu S, Murugan K, Panneerselvam C, Alrefaei MSS, et al. Insecticide susceptibility in larval populations of the West Nile vector Culex pipiens L. (Diptera: Culicidae) in Saudi Arabia. Asian Pacific Journal of Tropical Biomedicine. 2016;6(5):390-395

Marcello N. Three Scenarios in insect-insect borne diseases. In: Nicoletti M, editor. Insect-insect Borne Diseases in the 21st Century. Academic Press; 2020. pp. 99-251.

Menz, M. H., Scacco, M., Bürki-Spycher, H. M., Williams, H. J., Reynolds, D. R., Chapman, J. W., & Wikelski, M. (2022). Individual tracking reveals long-distance flight-path control in a nocturnally migrating moth. Science, 377(6607), 764-768.

Morin CW, Comrie AC, Ernst K. Climate and dengue transmission: Evidence and Implications. Environmental Health Perspective. 2013;121:1264-1272.

Njenga, S. M., Kanyi, H. M., Mutungi, F. M., Okoyo, C., Matendechero, H. S., Pullan, R. L., ... & Won, K. Y. (2017). Assessment of lymphatic filariasis prior to re-starting mass drug administration campaigns in coastal Kenya. Parasites & vectors, 10, 1-9.

Özbilgin, A., Töz, S., Harman, M., Topal, S. G., Uzun, S., Okudan, F., ... & Özbel, Y. (2019). The current clinical and geographical situation of cutaneous

leishmaniasis based on species identification in Turkey. Acta Tropica, 190, 59-67.

Palma, V. A., Crespín, M. M., Hidalgo, P. A., González, Á. D., Lozada, D. A., Nacimba, G. A., ... & Borja-Cabrera, G. P. (2024). Diagnostic advances in tegumentary leishmaniasis: a narrative review from 2018 to 2023. Journal of Public Health and Emergency, 8.

Paz S. Climate change impacts on West Nile virus transmission in a global context. Philosophical Transactions of the Royal Society B. 2015;370(1665):20130561.

Rocklöv J, Dubrow R. Climate change: An enduring challenge for vector-borne disease prevention and control. Nature Immunology. 2020;21:479-483.

Romiti, F., Casini, R., Magliano, A., Ermenegildi, A., & De Liberato, C. (2022). Aedes albopictus abundance and phenology along an altitudinal gradient in Lazio region (central Italy). Parasites & Vectors, 15(1), 92.

Uyar, Y., & Bakır, E. (2016). West Nile virus (WNV) and current status of West Nile Virus in Turkey.

WHO. A global brief on vector-borne diseases. Geneva, Switzerland, World Health Organization; 2014 Contract no: WHO/DCO/WHD/2014.1.

World Health Organization. (2012). Global strategy for dengue prevention and control 2012-2020.

World Health Organization. (2013). Sustaining the drive to overcome the global impact of neglected tropical diseases: second WHO report on neglected diseases (No. WHO/HTM/NTD/2013.1). World Health Organization.

World Health Organization. (2014). A global brief on vector-borne diseases (No. WHO/DCO/WHD/2014.1). World Health Organization.

World Health Organization. (2023). World malaria report 2023. World Health Organization.