Review Article

The Impact of COVID-19 Pandemic on Arthropod-Related Diseases

*Vahideh Moin-Vaziri[1], Mehdi Badakhshan[2]

[1]Department of Medical Parasitology and Mycology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2]Department of Medical Entomology and Vector Control, School of Public Health, Urmia University of Medical Sciences, Urmia, Iran

***Corresponding author:** Dr Vahideh Moin-Vaziri, E-mail: vmvaziri@gmail.com, v.vaziri@sbmu.ac.ir

(Received 11 July 2021; accepted 12 Mar 2023)

Abstract

Background: The Covid-19 pandemic that caused by the infection with the novel Coronavirus SARS-CoV-2 has revealed individual and global vulnerabilities all over the world. Many countries that had been struggled with arthropod-borne diseases (VBDs) are now embroiled in another challenge caused by COVID-19 pandemic. The situation that poses major obstacles 1) by misdiagnosis 2) delay in early and appropriate treatment of VBDs 3) difficulties in applying regular strategy for vector control and prevention methods and finally 4) irregularity in financing supports. Given the possible scenario of syndemics, it is important to plan integrated and combined measurement with the maximum participation of the people and health authorities. Here, the impact of COVID-19 pandemic on some major arthropod-related diseases will be discussed.

Methods: To access the collective data all related databases such as Science direct, PubMed, Elsevier, Google scholar, as well WHO web page were searched with key words "arthropoda-related diseases, COVID-19 with the name of each individual disease".

Results: The results showed that the management, control, and treatment of most important arthropod-related diseases could be delayed due to COVID-19 pandemic.

Conclusion: Dealing with COVID-19, it is crucial to consider the other main killers such as malaria, dengue fever, etc. more especially in vulnerable populations by greater political, financial and global commitment. Continued surveillance will be essential to monitor for any possible changes.

Keywords: Arthropoda-related diseases; COVID-19; Syndemics

Introduction

Arthropods are large phylum in the kingdom Animalia and include most known animal species mainly belong to insects, spiders, mites, ticks, and scorpions. They may effect on human health by direct effects, such as bites/stings, allergic reactions, entomophobia, myiasis or indirectly by the transmission of some important diseases like malaria, leishmaniasis, dengue fever, yellow fever, and so on (1-2). They caused a lot of morbidity, mortality and economic losses, globally (2).

To make a brief reference to the importance of vector borne diseases (VBDs), it is suffice to look at the global statistics; malaria global cases in 2020 was reported as 241 million cases, and the estimated number of malaria deaths stood at 627000 (3). Annual new cases of leishmaniasis estimated as 700000 to 1 million, out of them 50000 to 90000 cases belong to the visceral leishmaniasis, fatal form of disease (4). The number of dengue cases increased dramatically about eight fold over the last two decades and has been listed as a potential threat for 2020 and recent outbreaks in many countries confirmed this claim, with 100–400 million infections annually (5). Although

http://jad.tums.ac.ir
Published Online: March 31, 2023

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these data help us to have a glimpse on the importance of VBDs, but this is not the whole story, just a handful of examples.

Several factors could affect on VBDs such as climate change, trade and travel (esp. global air travel and seaborne trade), human migration, socio-economic and ecological drivers (land use, farming practices, natural fauna, public health situation, human life style…), and as well political agenda. Any other factor that changed these elements will affect the prevalence and incidence of VBDs. Recently, the COVID-19 pandemic has led to significant loss of life and impact on other aspects of human life such as public health, food systems and the world of work, resulting in extreme poverty and poor public health (6-7). The purpose of this article is to emphasize on the impact of COVID-19 on the most important arthropod problems based on available literatures.

COVID-19 and Malaria

Malaria caused by different species of *Plasmodium* and transmitted by anopheline mosquitoes, it is one of the highest contributors to morbidity and mortality in the world, with 627000 death in 2021 (3). The declining malaria burden over the past 20 years reflects major advances in disease control due to multidisciplinary interventions in the vector control, early diagnosis and anti-malarial therapies (8). This trend creates a promising outlook to eliminate malaria from Asia pacific by 2030 and Africa by 2050, a success which seems fragile and probably remains behind due to COVID-19. As a prediction, the world will return to the level of mortality in 2000 (7, 9-10). Also, it was stated that deaths due to malaria could increase over 5 years up to 36%, compared with no COVID-19 pandemic (11). One of the risk factors for malaria expansion is travelling to/or from endemic areas (12) at first glance, travel restrictions due to the COVID-19 quarantines could be regarded as a positive hint, but will be faded by some adverse impact of COVID-19 on; 1) malaria vector control (irregularities in insecticide-treated nets distribution as well, larval and adult mosquito control measurements), 2) detection and treatment (interruption the health facilities due to the fear of exposure to COVID-19, difficulty in transportation, need of additional resources to protect health care workers from COVID-19, 3) economic collapse and health system failure, 4) population movement due to the economic crisis (11–. Malaria control can be affected by other potential factors, such as the death of health care workers, as well by misdiagnosis of malaria cases in returning travelers in time of COVID-19 pandemic (11, 13–14), 16-17). Practical recommendations for decision maker are available to keep the staff safe and to maintain main services at community level (18). Continued and more concentrated epidemiological surveillance will be essential to better withstand challenges in malaria endemic area (19).

COVID-19 and Leishmaniasis

Leishmania is an obligate intracellular pathogen that invades phagocytic host cells, and it was transmitted to vertebrate hosts by approximately 30 species of phlebotomine sand flies. Leishmaniasis is among the neglected tropical disease (NTDs), with three main clinical forms, visceral (the most serious form), cutaneous (the most common), and mucocutaneous. Globally, about 90 countries are considered endemic for leishmaniasis (20) so it is very likely that leishmaniasis and COVID-19 have a spatial and temporal overlaps. Leishmaniasis is associated with poverty, lack of basic sanitation, malnutrition, population displacement, poor housing, weak immune system and lack of financial resources (4). As COVID-19 triggered the individual and global vulnerabilities, it is well clear that it could have an enhancing effect on leishmaniasis burden as reported from Brazil recently (21). In the fear of corona virus patients who were suspected to cutaneous form of disease may not refer to the physician in appropriate time that not only exacerbate the lesions but also effect on the transmission

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Published Online: March 31, 2023

cycle of disease, especially in the anthroponotic form which humans act as main reservoirs. On notice, in visceral form, as the fatal form of leishmaniasis, the situation is more complicated. Although it does not share clinical features with COVID-19, but because of distinct immunopathogenesis between diseases, VL patients showed vulnerability in their immune system against antiviral responses (22-23) So, endemic neglected diseases like VL should be more considered during COVID-19 pandemic.

COVID-19 and arthropod-borne viruses

The term "arboviruses" refers to the viruses that biologically transmitted to vertebrates by different species of arthropods mainly culicine mosquitoes and ixodid ticks (24). It is important to raise the global awareness on the possible impact of COVID-19 on arboviral diseases. The most important arboviruses will be discussed following.

COVID-19 and Dengue fever

Dengue is a major public health problem especially in tropical and sub-tropical regions; it is caused by four serotypes of dengue virus (DENV) and transmitted by mosquitos, mainly by *Aedes aegypti*. The global incidence of dengue has grown dramatically recently and about half of the world's population is now at risk. The number of dengue cases increased 8 fold over the last two decades, from 505,430 cases in 2000, to over 4.2 million in 2019. Reported death cases between the year 2000 and 2015 increased from 960 to 4032 (5). In syndemic areas of dengue fever and COVID-19 the problem increased for the health system(25-26). Similar clinical manifestations shared by COVID-19 and dengue fever have raised concerns in two ways; at first by confusing the physicians in the correct diagnosis of disease, considering this fact that dengue is the leading cause of febrile illnesses in travelers who returns from South-East Asia (25-27), secondly by potential false-positive results in the patients with pre-existing DENV antibodies that could make a cross-reactivity between SARS-CoV-2 and DENV. Although, the results of a preliminary study in Italy on a small number of serum samples (32 samples) can downsize this concern as they stated that "the concern about false-positive dengue serology in COVID-19 patients could be downsized, at least when an ELISA is used" (28).

By the way, in endemic areas of dengue, COVID-19 act as a double punch for patients and for public health by further spread of the virus and the risk of health-workers collapsing (26, 29-35).

On the other hand, in the lack of vaccine and specific treatment for dengue fever, the only intervention method that seems to work is vector control, (5) which accordingly might have decreased in the community and dengue prevention programs during COVID-19 pandemic (36-37). Since simultaneous infections will worsen the epidemiological situation, special attention should be done on the patients who live or had the history of travel to dengue endemic areas. It should be mentioned that the restriction on movement of people to curb Covid-19 could decrease the cases in a period of time as reported in Sri Lanka (38).

COVID-19 and Yellow fever

Yellow fever which mostly occurs in South America and Sub-Saharan Africa, is an acute viral hemorrhagic disease caused by a mosquito-borne flaviviruses. The "yellow" in the name refers to the jaundice that affects some patients. Yellow fever control started by early application of quarantine in 15th century and shifted to more coordinated approach through time, and today includes vaccine requirement at the entrance of the countries (39). There is currently no specific antiviral drug for yellow fever, but the Eliminate Yellow fever Epidemics Strategy (EYEs) that launched in 2017, aimed to protected more than 1 billion people by 2026 (40). Large-scale vaccination is the main arm of this struggle, and unfortunately easily could affected by COVID-19 pandem-

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Published Online: March 31, 2023

ic, especially in Syndemic areas (41-42). Although some restriction rules for COVID-19, such as home quarantine, closing the borders, travel restriction and prohibition of social and religious events could mitigate yellow fever dispersion too, but the adverse effects of the current pandemic cannot be ignored. Without a doubt, the main obstacle is the economic crisis of the countries that affect the health system and the routine diplomacy. Regularly, risk of yellow fever in urban areas could be reduced by eliminating the potential mosquito breeding sites by applying larvicides in water storage containers and anywhere that standing water collect (40), which under the shadow of COVID-19 will certainly be affected (43).

COVID-19 and Zika virus

Zika virus is a *Flavivirus* that firstly identified in 1947 in monkeys, the initial report of humans infection was in Uganda and the United Republic of Tanzania in 1952 which continued by several epidemics in different countries in 2007, 2013 and 2015 (large outbreak in Brazil). The main vector is day-biting mosquito *Aedes aegypti* (44). So far, no vaccines or antiviral drugs are licensed for ZIKA, so the only way left is 1) personal protection against mosquito bites during the day and early evening 2) using physical barriers 3) applying insect repellent to skin or clothing and finally 4) elimination mosquito breeding sites. The latter one requires community initiatives to support local government and public health programs to reduce mosquito breeding sites (44), which will certainly be affected by the problems caused by the COVID-19 (45).

COVID-19 and Pediclusis

Human Pediclusis is defined as infestation to body lice (*Pediculus humanus*) and head lice (*Pediculus capitis*). Pediclusis due to head lice still remains a public health problem, it is extremely contagious, it could be found in any age, but it is more common among young children aged 3 to 12 years (46). Transmission had occurred commonly by close human-to-human contact, through social and family relationships(46). Two main strategies against pediculosis are individual control and prevention of its transmission (46). When WHO declared the COVID-19 as a global pandemic in March 2020, the governments of different countries imposed the mandatory quarantine, social distance, and public lock down. These restriction rules forced the students, as the most vulnerable ones for pediculosis, to stay at home and have virtual education; as a result the close contact was interrupted and it can be concluded that it will have a reducing effect on the prevalence of *P. capitis*, the fact that was proved by a survey in Argentina (46).

COVID-19 and scabies

Scabies is one of the earliest human diseases caused by *Sarcoptes scabiei* and transmitted by direct skin-to-skin contact (47). Regardless of socioeconomic status, it is a public health issue in all countries, but its prevalence would be enhanced with poverty, malnutrition, overcrowded conditions, and immune-compromised status (48-49). Delay in refereeing to the physician can lead to delay in diagnosis and inadequate treatment which in turn can lead to further dispersion; a condition that occurs more frequently during COVID-19 quarantine in comparison to the life before (50-51).

Conclusions

Dealing with COVID-19, it is crucial to not ignore the other main killers such as malaria, dengue fever and so forth. More especially in vulnerable populations by greater political, financial, and global commitment.

Acknowledgments

We would like to thank all scientists who have worked on this matter for ages whose work is pointed out here.

Conflict of interest statement

The authors declare there is no conflict of interests.

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