MAEDICA – a Journal of Clinical Medicine
2022; 17(1): 201-204
https://doi.org/10.26574/maedica.2022.17.1.201

MÆDICA - a Journal of Clinical Medicine

MINI REVIEW

Vector-Borne Diseases amidst COVID-19 Pandemic in India – A Mini-Review

K. ARIYANACHI[a], Jyothi Tadi LAKSHMI[b], Nikhat Shalam SHIREEN[b], Meena S. VIDYA[c], Garapati SUPRIYA[a], Mallamgunta SARANYA[d], S Triveni SAGAR[e], Kesavulu CHENNA[e]

[a]Department of Anatomy, All India Institute of Medical Sciences, Bibinagar, India

[b]Department of Microbiology, All India Institute of Medical Sciences, Bibinagar, India

[c]Department of Anatomy, Tiruvallur Medical College, Tamil Nadu, India

[d]Department of Microbiology, ESIC Medical College & Hospital, Hyderabad, India

[e]Department of Medicine, ESIC Medical College & Hospital, Hyderabad, India

ABSTRACT

Introduction: *Vector-borne diseases are infections caused by parasites, viruses and bacteria and transmitted by vectors, which are usually insects. A greater risk of diseases such as dengue, malaria, seasonal influenza, leptospirosis, chikungunya, enteric fever, etc co-exist in COVID-19 cases. This poses challenges in clinical and laboratory diagnosis of COVID-19, which may affect clinical management and patient outcomes.*

Methodology: *Several databases, including PubMed, Scopus, DOAJ, and EMBASE, were reviewed using the keywords vector-borne infections in India amidst COVID-19 pandemic. A total of 23 articles and WHO and National website for vector-borne diseases was found.*

Review: *For many decades, vector-borne diseases have been a major health burden for both underdeveloped and developing countries, including India. With better preparedness, the threat of climate change on vector-borne diseases may be negated. Rains during monsoon increase not only the risk of vector-borne diseases such as malaria, dengue, chikungunya but also that of food- and water-borne diseases as well as other skin infections. A greater risk of diseases such as dengue, malaria, seasonal influenza, leptospirosis, chikungunya, enteric fever, etc co-exists in COVID-19 cases. This poses challenges in clinical and laboratory diagnosis of COVID-19, which may affect clinical management and patient outcomes (3).*

Amidst the COVID-19 pandemic, a sudden outbreak of Zika virus infection was reported at the beginning of July 2021 in the districts of Kerala, from where it started, spreading to the neighboring states of Tamil Nadu and Kerala, India.

Conclusion: *With better preparedness, the threat of climate change on vector-borne diseases may be negated. Designing and strengthening an intervention strategy for environmental sanitation, regular*

Address for correspondence:
Dr. Lakshmi Jyothi Tadi, Additional Professor
Department of Microbiology, All India Institute of Medical Sciences, Bibinagar, India
Email: dr.tljyothi@gmail.com

Article received on the 7th of February 2021 and accepted for publication on the 3rd of March 2022

cleaning of living houses, and keeping personal hygiene shall be considered. Risk assessment is crucial to optimize surveillance, preventative measures (vector control), and resource allocation (medical supplies).

Keywords: COVID-19, dengue, malaria, chikungunya, Zika virus infection, vector-borne diseases (VBDs).

INTRODUCTION

The COVID-19 epidemic is putting the world's resilient health systems to the test. During the monsoons, vector-borne illnesses can spread quickly. In the middle of the COVID-19 epidemic, ignoring preventive control measures might lead to a rise in number of vector-borne infections and overwhelm health systems. During this epidemic, the World Health Organization (WHO) has emphasized the critical need to maintain efforts to prevent, diagnose, and cure malaria in Sub-Saharan Africa (1). A similar strategy should be used for the control of arboviral illnesses of global relevance, including dengue, Zika, chikungunya and yellow fever. Many nations were already struggling to manage dengue fever before the COVID-19 epidemic. Public health initiatives launched to stop the spread of COVID-19 have already had a significant impact on normal vector surveillance and control efforts such as regular household surveys (1, 2). COVID-19, in combination with outbreaks of dengue or other vector-borne diseases (VBDs), may have potentially disastrous implications. ❑

METHODOLOGY AND REVIEW

For many decades, vector-borne diseases have been a major health burden for both underdeveloped and developing countries, including India. Vector-borne diseases are infections caused by parasites, viruses, and bacteria and transmitted by vectors, which are usually insects – they ingest pathogens while taking a blood meal from an infected host (human or animal) and transmit it into a new host, after the pathogen has multiplied inside them. Once a vector becomes infectious, it remains so for the rest of its life, transmitting the infection during each subsequent bite/blood meal. Mosquitoes are the most common type of vectors. Thus, Aedes mosquito serves as vector for dengue, chikungunya, yellow fever and Zika, Anopheles for malaria, and Culex for Japanese encephalitis. Rat fleas act as vectors for plague (transmitted from rats to man), sandflies for Kala-azar, chiggers (larvae) of mites for scrub typhus; ticks and lice can also serve as vectors. Rains during the monsoon increase not only the risk of vector-borne diseases such as malaria, dengue, chikungunya but also that of food- and water-borne diseases as well as other skin infections. It has been estimated that the overall co-infection of SARS-CoV-2 and vector-borne diseases is 11.4% (3). This poses challenges in clinical and laboratory diagnosis of covid-19, which may affect clinical management and patient outcomes.

By breaking the healthcare interventions that were previously committed to them, COVID-19 has become a catalyst for the spread of numerous potentially fatal illnesses throughout the world. Healthcare sectors have devoted their full attention to combating COVID-19, while ignoring previous diseases such as vector-borne infections.

Amidst the COVID-19 pandemic, a sudden outbreak of Zika virus infection was reported at the beginning of July 2021 in the districts of Kerala, from where it started spreading to the neighboring states of Tamil Nadu and Kerala. Following this, the Health and Family Welfare department of these states intensified the vector control programmes. As of August 2021, a total number of 65 Zika virus cases were reported (4). Zika virus is primarily transmitted through the bite of infected Aedes aegypti mosquitoes. Zika virus infection usually presents with fever, headache, rash, muscle pain and conjunctivitis, and symptoms may last more than a week. Zika could be transmitted during pregnancy from the mother to the fetus, resulting in congenital defects. The combination of the Zika virus and the COVID-19 pandemic in the clinical picture may enhance the risk of illness misdiagnosis. The high rate of COVID-19 patients leads to a low rate of Zika virus diagnosis. As a result of the delay in treatment start, this condition may create a delay in the accurate diagnosis and aggravate the symptoms (5). Poor disease surveillance and inadequate diagnosis in resource-constrained situations are among the challenges of Zika virus during the COVID-19 pandemic. Another issue the Zika virus faces during the COVID-19 pandemic is a lack of laboratories to test for the virus, as most of the existing laboratories have been modified to exclusively test for the COVID-19 pandemic, potentially increasing the virulence of infection if proper precautions are not taken (5). Guillain–Barré syndrome and congenital Zika syndrome with microcephaly are two of the most feared Zika sequelae. The Zika virus disease (ZVD) has major public health and socioeconomic consequences. As the host, agent, and environment) are all favorable to Zika development in India, there is a significant chance that ZVD may become endemic in the country, which is particularly hazardous given the current epidemic (6).

Severe dengue outbreak was reported in the Firozabad of Uttar Pradesh, India, during September 2021 amidst the COVID-19 pandemic. At least 578 cases were reported in a period of one month, out of which 84 were children and at least 58 of patients died because of dengue hemorrhagic fever (7). In tropical and subtropical parts of the world, dengue fever is the most prevalent arboviral infection. Dengue fever is estimated to infect 96 million people each year, resulting in 21,000 fatalities globally (8). Dengue virus is primarily transmitted through the bite of infected Aedes aegypti mosquitoes. Fever, headache, arthromyalgia, retro-orbital discomfort, and rash are some of the signs and symptoms of dengue infection. Due to the identical clinical and laboratory characteristics of these illnesses, the COVID-19 pandemic in dengue-endemic areas is a public health issue. This complicates the proper identification and treatment of both illnesses. However, the management of these two infections is entirely different. Moreover, during the pandemic, dengue virus infection has been observed in SARS-CoV-2 infected individuals (9, 10). Co-infection with several diseases has been linked to a greater rate of morbidity than occurrence of these diseases alone (11, 12).

Malaria is a parasitic protozoan illness transmitted to humans by an infective bite by female Anopheles mosquitoes infected with plasmodium species. India has been fighting malaria for many years and has the third largest malaria load in the world (13). Throughout the years, the Indian government has established a variety of initiatives to avoid vector-borne illnesses, including the National Vector Borne Disease Control Programme (NVBDCP) and National Rural Health Mission (NRHM), which have greatly aided in the elimination of the infection (14). Malaria initiatives across the nation were halted as a result of the danger of a novel coronavirus epidemic, and most of the money and healthcare resources were transferred to combat COVID-19. Furthermore, due to changes in community-based practices of frontline healthcare workers, routine malaria monitoring was hindered during the COVID-19 pandemic. Malaria and COVID-19 share common symptoms. Malaria symptoms appear 10–15 days after a highly infectious bite; multi-organ failure is prevalent in severe instances in adults, and respiratory distress is prevalent in children with malaria, which is similar to what is frequently seen in COVID-19 kids. As a result, a patient with malaria might be misdiagnosed as COVID-19 if symptoms alone are used to define a case without adequate testing (15).

In the review of Dhiman *et al*, the authors explain the PRECIS model (driven by HadRM2) – a regional climate model (RCM) that takes large scale atmospheric and ocean conditions from observations or global climate models (GCM) where horizontal resolutions vary from 100 to 300 kilometers, and downscales it over a region of interest to resolutions of 25 or 50 km. It was found that Orissa, West Bengal and Southern parts of Assam will still remain malarious and transmission windows will open up in Himachal Pradesh and North-Eastern states, etc. Impact of climate change on dengue also reveals an increase in transmission with 2°C rise in temperature in Northern India (16).

Riad *et al* developed a risk-assessment framework using climate (average temperature and rainfall) and host demographic (host density and movement) data, particularly suitable for regions with unreported or underreported incidence data. His framework consisted of a spatiotemporal network-based approach coupled with a compartmental disease model and nonhomogeneous Gillespie algorithm based on the risk-assessment framework using both climate and demographic data. The correlation of climate data with vector abundance and host-vector interactions is expressed as a vectorial capacity-a parameter that governs the spreading of infection from an infected host to a susceptible one *via* vectors. This framework is capable of vector-borne disease risk assessment without historical incidence data and can be a useful tool for preparedness with accurate human movement data (17).

Currently, vector-borne illnesses remain mostly unnoticed, causing sickness primarily among the impoverished. Fever is the most frequent symptom of zika, dengue, malaria, and COVID-19, making a proper diagnosis for either illness difficult at the moment (18, 19). Encouragement and information for early fever screening should be made available to both rural and urban populations. Monsoons tend to facilitate the spread of Aedes aegypti, which is the main vector for most of the vector-borne infections in India. Solid wastes to be eliminated then and there to prevent the breeding of the mosquitoes. At the home, neighborhood, and institutional levels, vector management should involve larval surveillance, biological, and chemical control. Surveillance and source reduction operations for Aedes larvae should be conducted in airports, seaports, and rural and urban civic wards. When suspecting the sickness, a travel history should be considered. The usage of insect repellent as a preventive strategy to decrease mosquito bites must be maintained among the people living in areas endemic to vector-borne diseases (20). ❑

CONCLUSION

With better preparedness, the threat of climate change on vector-borne diseases may be negated. Designing and strengthening an intervention strategy for environmental sanitation, regular cleaning of living house, and keeping personal hygiene shall be considered. Risk assessment is crucial to optimize surveillance, preventative measures (vector control), and resource allocation (medical supplies). ❑

Conflicts of interest: none declared.
Financial support: none declared.

REFERENCES

1. WHO urges countries to ensure the continuity of malaria services in the context of the COVID-19 pandemic 2020 March 25 (Cited 2020 March 31). In: World Health Organization. Press release (Internet). Geneva, Switzerland: WHO.
2. **Rodriguez-Morales AJ, Gallego V, Escalera-Antezana JP, et al.** COVID-19 in Latin America: The implications of the first confirmed case in Brazil. *Travel Med Infect Dis* 2020;35:101613.
3. https://www.livemint.com/news/india/coinfection-of-coronavirus-with-vector-borne-disease-may-impact-covid-management-11627400925037.html
4. https://www.hindustantimes.com/india-news/as-zika-virus-spreads-in-kerala-tamil-nadu-and-karnataka-step-up-vigil-101625969500482.html
5. **Aborode AT, Sukaina M, Kumar H, et al.** Zika virus endemic challenges during COVID-19 pandemic in Africa. *Trop Med Health* 2021;49:82. https://doi.org/10.1186/s41182-021-00372-6
6. **Bardhan M, Pramanik D, Riyaz R, et al.** Dual burden of Zika and COVID-19 in India: challenges, opportunities and recommendations. *Trop Med Health* 2021;49:83. https://doi.org/10.1186/s41182-021-00378-0
7. https://timesofindia.indiatimes.com/city/agra/over-500-active-dengue-cases-in-firozabad-death-toll-reaches-110/articleshow/86124070.cms
8. **Bhatt S, Gething PW, Brady OJ, Messina JP, et al.** The global distribution and burden of dengue. *Nature* 2013;496:504-507.
9. **Verduyn M, Allou N, Gazaille V, et al.** Co-infection of dengue and covid-19: a case report. *PLoS Negl Trop Dis* 2020;14:1-5.
10. **Epelboin L, Blondé R, Nacher M, et al.** COVID-19 and dengue co-infection in a returning traveller. *J Travel Med* 2020;27:taaa114.
11. **Kembuan GJ.** Dengue serology in Indonesian COVID-19 patients: coinfection or serological overlap? *IDCases* 2020;22:e00927.
12. **Estofolete CF, Machado LF, Zini N, et al.** Fatal stroke as presentation of SARS-CoV-2 and dengue virus coinfection. *J Med Virol* 2021;93:1770-1775.
13. **Kumar A, Valecha N, Jain T, Dash AP.** Burden of malaria in India: retrospective and prospective view. *Am J Trop Med Hyg* 2007;77:69-78.
14. **Narain JP, Nath LM.** Eliminating malaria in India by 2027: the countdown begins! *Indian J Med Res* 2018;148:123-126.
15. **Siddiqui AF, Wiederkehr M, Rozanova L, Flahault A.** Situation of India in the COVID-19 pandemic: India's initial pandemic experience. *Int J Environ Res Publ Health* 2020;17:8994.
16. **Dhiman Ramesh C, et al.** Climate change and threat of vector-borne diseases in India: are we prepared? *Parasitology Research* 2010;106:763-773. doi:10.1007/s00436-010-1767-4.
17. **Riad Mahbubul H, et al.** Risk Assessment of Dengue Transmission in Bangladesh Using a Spatiotemporal Network Model and Climate Data. *Am J Trop Med Hyg* 2021;104:1444-1455. doi:10.4269/ajtmh.20-0444
18. **Bicudo N, Bicudo E, Costa JD, et al.** Co-infection of SARS-CoV-2 and dengue virus: a clinical challenge. *Braz J Infect Dis* 2020;24:452-454.
19. **Mahajan NN, Kesarwani SN, Shinde SS, et al.** Co-infection of malaria and dengue in pregnant women with SARS-CoV-2. *Int J Gynaecol Obstet* 2020;151:459-462.
20. **Di Gennaro F, Marotta C, Locantore P, et al.** Malaria and COVID-19: common and different findings. *Trav Med Infect Dis* 2020;5:141.