IJSRIS journal
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH AND INNOVATIVE STUDIES
ISSN: 2820-7157
www.ijsrisjournal.com

October 2024 | Volume 3 | Number 5 | Pages 107-109

Received Date: September 14, 2024 **Accepted Date:** October 12, 2024 **Published Date:** November 13, 2024

Available Online at https://www.ijsrisjournal.com/index.php/ojsfiles/article/view/228

Epidemiological Patterns of Dengue Fever: A Review

Forat Abud Rab Alrasoul Almanasif [1], Huda Saeed Alhabib [1], Zahra Abdulmohsen Al Khamis [2], Sakinah Abdallah Almanasif[3], Mustfa Abdallah Almanasif[3], Rayhana Abduallah Almanasif[4], Shaimaa Ali Ahmed Al Manasif[5], Zahra Ali Al Jaber[6], Jumanah Mohammad Al Madan[7], Ali Khalil Hamadah [8], Ali Abdulbaqi Algambar[8], Hussain Abdullah S Alghawi [8], Mahdi Hussain Almakhamil[8], Zahra Ali S Abualmakarem[8], Huda Mohmmed A Al Ramadhan[3], Enjoud Waheed Abdul Aziz Almahasnah[8]

1.Dammam medical complex, , Saudi Arabia.
2.Radiology technologist, Safwa Medical complex, Saudi Arabia.
3.Qatif Central Hospital, , Saudi Arabia.
4.Safwa Medical Complex, , Saudi Arabia.
5.Ras tanura general hospital, , Saudi Arabia.
6.Jubail General Hospital, Saudi Arabia.
7. Prince Mohammad bin Fahd general hospital and hereditary blood diseases, Saudi Arabia.
8. KHAFJI GENERAL HOSPITAL, Saudi Arabia.

ABSTRACT

Dengue fever is a rapidly spreading mosquito-borne viral disease, especially prevalent in tropical and subtropical regions worldwide. The incidence and geographic distribution of dengue fever have dramatically increased over the past few decades due to factors like climate change, urbanization, and global travel. This review examines the current epidemiological patterns of dengue, its global distribution, trends in incidence, seasonality, risk factors, and the challenges faced in controlling outbreaks. Recent advances in surveillance, vector control, and vaccine development are also discussed.

Keywords: Dengue Fever, Mosquito-borne viral disease, ,Risk factors.

Introduction

Dengue fever is caused by the dengue virus (DENV) and is transmitted primarily by Aedes aegypti and Aedes albopictus mosquitoes. With an estimated 390 million infections annually, dengue is a major public health concern worldwide(1). Over half the world's population lives in areas at risk of dengue infection, with the burden of disease disproportionately affecting tropical and subtropical regions. Understanding the epidemiology of dengue is essential for developing prevention and control strategies.

1. Global Distribution and Incidence Trends

- **Geographical Spread** Dengue is endemic in more than 100 countries across Southeast Asia, Latin America, the Western Pacific, and parts of Africa. Climate change, increased urbanization, and global travel have allowed the virus to spread to previously unaffected regions, including parts of Europe and North America(2) .

- **Increasing Incidence** The global incidence of dengue has increased significantly over the past few decades. The number of reported cases has risen from around 500,000 cases annually in the early 2000s to over 4 million cases in recent years(3). This increase is due to a combination of improved surveillance and reporting, population growth, and a genuine rise in dengue transmission.

- **Population and Demographic Patterns** Children and young adults in endemic areas are particularly vulnerable to dengue due to high exposure to mosquito bites and limited immunity. However, in regions with hyperendemic transmission (where multiple dengue serotypes co-circulate), adults are also at risk of infection and severe disease due to antibody-dependent enhancement (4).

2. Seasonal and Environmental Patterns

- **Seasonality** Dengue transmission is often seasonal, peaking during or after the rainy season in tropical regions. Rainfall creates standing water, which serves as breeding sites for Aedes mosquitoes. Warmer temperatures also accelerate mosquito development and increase the frequency of mosquito feeding(5) .

- **Urbanization and Land Use** Dengue is primarily an urban disease, as urban areas provide ideal breeding sites for Aedes mosquitoes. Poor sanitation, crowded living conditions, and inadequate waste management in urban areas increase human exposure to mosquitoes. Dengue is also emerging in rural areas due to changes in land use and human migration patterns (6).

- **Climate Change** Rising temperatures and changing precipitation patterns due to climate change have contributed to the spread of dengue into new regions. Warmer temperatures accelerate the viral incubation period within mosquitoes, and increased rainfall provides breeding sites, leading to more frequent and severe outbreaks (7).

3. Factors Influencing Dengue Outbreaks

- **Population Growth and Globalization** Rapid population growth and urbanization in dengue-endemic regions, along with increased global travel, have contributed to the spread of dengue. Travelers and migrants can introduce the virus into new areas, leading to localized outbreaks in non-endemic regions with suitable mosquito vectors(8) .

- **Serotype Shifts and Immunity** The dengue virus has four distinct serotypes (DENV-1, DENV-2, DENV-3, and DENV-4). Infection with one serotype provides lifelong immunity to that serotype, but increases the risk of severe disease upon subsequent infection with a different serotype, a phenomenon known as antibody-dependent enhancement (ADE)(9). Shifts in circulating serotypes can lead to large outbreaks as immunity within the population fluctuates.

- **Vector Control and Public Health Measures** Effective vector control and public health interventions can reduce the incidence of dengue. However, inadequate or inconsistent control measures, coupled with insecticide resistance in mosquito populations, make it challenging to control outbreaks. Some countries, like Singapore, have implemented comprehensive vector control programs with notable success (10,11).

4. Challenges in Dengue Surveillance and Control

- **Inconsistent Surveillance** Many dengue-endemic regions lack standardized surveillance systems, resulting in underreporting and limited data. The lack of reliable surveillance data hinders accurate assessment of global dengue trends and limits the ability to predict outbreaks. Improved surveillance and data sharing are essential for a coordinated response to dengue .

- **Diagnostic Limitations** Diagnosing dengue can be challenging due to the overlap of symptoms with other febrile illnesses. Laboratory testing is often required for confirmation, which may not be feasible in resource-limited settings. The development of rapid diagnostic tests has improved dengue detection, though their accuracy varies .

- **Insecticide Resistance** The primary method of controlling dengue vectors has been the use of insecticides. However, resistance to commonly used insecticides has developed in many Aedes mosquito populations, reducing the efficacy of chemical control measures. Integrated approaches are needed to manage insecticide resistance and maintain vector control effectiveness .

5. Advances in Dengue Prevention and Control

- **Vaccination** The development of the first dengue vaccine, Dengvaxia, represents a significant advancement, though it is recommended only for individuals with prior dengue exposure due to the risk of severe disease in dengue-naïve individuals. New vaccines, such as TAK-003, are currently in development and show promise in providing protection against multiple dengue serotypes(12).

- **Genetic Control of Mosquitoes** Innovative vector 7. control strategies, such as the release of genetically modified mosquitoes and mosquitoes infected with Wolbachia bacteria, are being tested. Wolbachia-infected mosquitoes have shown reduced ability to transmit the dengue virus, and field trials have demonstrated reduced dengue incidence in treated areas (13).

- **Integrated Vector Management (IVM)** Integrated Vector Management combines various control strategies, such as environmental management, chemical control, and community education, to reduce mosquito breeding sites and human exposure. IVM has shown success in countries with coordinated efforts and strong public health systems .

Conclusion

Dengue fever remains a global health challenge due to its increasing incidence and expanding geographical reach. Understanding the epidemiological patterns and factors driving dengue transmission is essential for improving prevention and control strategies. While progress has been made in vaccine development and novel vector control 13. approaches, challenges in surveillance, diagnostic accuracy, and sustainable control measures persist. A coordinated global response, supported by ongoing research and innovation, is crucial to reducing the burden of dengue fever worldwide.

References

1. Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL, et al. The global distribution and burden of dengue. Nature. 2013;496(7446).
2. Messina JP, Brady OJ, Pigott DM, Golding N, Kraemer MUG, Scott TW, et al. The many projected futures of dengue. Vol. 13, Nature Reviews Microbiology. 2015.
3. European Centre for Disease Prevention and Control. Dengue worldwide overview. Surveilance and disease data. 2022;(December 2022).
4. Chakravarti A, Kumaria R. Eco-epidemiological analysis of dengue infection during an outbreak of dengue fever, India. Virol J. 2005;2.
5. Ahmed T, Hyder MZ, Liaqat I, Scholz M. Climatic conditions: Conventional and nanotechnology-based methods for the control of mosquito vectors causing human health issues. Vol. 16, International Journal of Environmental Research and Public Health. 2019.
6. Man O, Kraay A, Thomas R, Trostle J, Lee GO, Robbins C, et al. Characterizing dengue transmission in rural areas: A systematic review. Vol. 17, PLoS Neglected Tropical Diseases. 2023.
7. Colón-González FJ, Fezzi C, Lake IR, Hunter PR. The Effects of Weather and Climate Change on Dengue. PLoS Negl Trop Dis. 2013;7(11).
8. Lourenço J, Recker M. Dengue serotype immune-interactions and their consequences for vaccine impact predictions. Epidemics. 2016;16.
9. Teo A, Tan HD, Loy T, Chia PY, Chua CLL. Understanding antibody-dependent enhancement in dengue: Are afucosylated IgG1s a concern? PLoS Pathog. 2023;19(3).
10.World Health Organization. Dengue guidelines for diagnosis, treatment, prevention and control. World Health Organization. 2009;
11. Quiñones ML, Norris DE, Conn JE, Moreno M, Burkot TR, Bugoro H, et al. Insecticide Resistance in Areas Under Investigation by the International Centers of Excellenc1. Malaria Research: A Challenge for Malaria Control and Elimination. Vol. 93, The American journal of tropical medicine and hygiene. 2015.
12. Capeding MR, Tran NH, Hadinegoro SRS, Ismail HIHM, Chotpitayasunondh T, Chua MN, et al. Clinical efficacy and safety of a novel tetravalent dengue vaccine in healthy children in Asia: A phase 3, randomised, observer-masked, placebo-controlled trial. The Lancet. 2014;384(9951).
13. Hoffmann AA, Montgomery BL, Popovici J, Iturbe-Ormaetxe I, Johnson PH, Muzzi F, et al. Successful establishment of Wolbachia in Aedes populations to suppress dengue transmission. Nature. 2011;476(7361).