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Arboviral Diseases: An Emerging Pandemic Threat

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ABSTRACT

None

The next major pandemic threat may not arise solely from respiratory viruses. WHO's R&D Blueprint prioritises Ebola and Marburg virus disease, Lassa fever, Crimean-Congo haemorrhagic fever, Nipah, Rift Valley fever, Zika, and Disease X because these pathogens combine epidemic potential with few effective countermeasures [1, 2]. Ecological adaptability, amplification under favourable conditions, and delayed detection within weak surveillance systems are common features [1, 2]. Arboviral diseases fit this profile and now need to be considered as part of the same preparedness agenda [3, 4].

Arboviral diseases are now characterised by sustained transmission and simultaneous outbreaks across regions rather than isolated epidemics [4]. For example, WHO estimates that nearly half of the world's population, approximately 3.9 billion people across more than 132 countries, is at risk of dengue, with an estimated 100–400 million infections occurring each year [5, 6]. Similar patterns are seen with chikungunya and other arboviruses [4, 7]. This shift from episodic outbreaks to continuous, multi-country transmission indicates a growing risk of large-scale epidemics and warrants their inclusion within pandemic preparedness frameworks [3, 4].

Arboviruses are grouped into three principal viral families: *Flaviviridae* (dengue, Zika, yellow fever, West Nile, and Japanese encephalitis viruses), *Togaviridae* (chikungunya and Mayaro viruses) and *Bunyaviridae* (Rift Valley fever and Crimean-Congo haemorrhagic fever viruses). Most are RNA viruses with marked genetic variability, allowing adaptation to new vectors and environments [8]. This biological plasticity, combined with favourable environmental conditions, supports persistence and expansion across diverse settings. The issue is no longer whether arboviral diseases will increase, but how rapidly this expansion will occur and whether health systems can respond in time.

Vector ecology remains central to this risk. *Aedes aegypti* and *Aedes albopictus* are now widely distributed beyond traditional tropical regions and are well adapted to urban environments [8]. Their breeding in small domestic water collections makes sustained control difficult. The presence of multiple competent vectors increases transmission resilience and limits the effectiveness of single interventions [9, 10]. Expansion into new geographic areas has already enabled local transmission in regions previously considered low risk [7, 10].

Environmental and social changes have accelerated this process. Rising temperatures, altered rainfall patterns, and increasing humidity favour vector survival and shorten viral replication cycles within mosquitoes [11]. Urbanisation contributes through high population density, inadequate water management, and proliferation of breeding sites [4, 5]. Population movement facilitates introduction of infection into receptive areas where vectors are already established [3, 4]. These interacting factors create conditions favourable for sustained transmission.

In India, the epidemiological pattern reflects sustained transmission rather than sporadic outbreaks. Dengue and chikungunya show recurring seasonal surges across multiple states. Japanese encephalitis remains a major cause of viral encephalitis in endemic regions. Chandipura virus disease and Kyasanur Forest disease continue to occur in distinct ecological regions, particularly in central and western India and the Western Ghats respectively [12–14]. The review by Gupta and colleagues highlighted the breadth of the burden, the absence of effective antivirals for most major arboviral diseases, and continuing gaps in surveillance, diagnostics, integrated vector management, and genomic surveillance [12]. These are not peripheral issues; they define the scale of the problem.

The WHO Global Arbovirus Initiative provides a coordinated response to these evolving risks [3, 4]. Built on six pillars, which are risk monitoring, reduction of local epidemic risk, strengthening of vector control, pandemic preparedness, innovation, and coalition-building, it emphasises an integrated One Health approach linking human, animal, and environmental surveillance [3, 4]. This is particularly relevant because many arboviruses are maintained in sylvatic or zoonotic cycles, circulating in animal reservoirs before spillover into human populations [4, 6]. Recognition of arboviruses within pandemic preparedness planning reflects a necessary shift away from viewing outbreaks as isolated events.

Beyond the better-recognised Aedes-borne viruses, several lesser-known arboviruses merit attention. The 2025 call to action from the WHO Global Arbovirus Initiative Technical Advisory Group notes that the spectrum of concern is wider than dengue, chikungunya, Zika, and yellow fever, and highlights recent Oropouche outbreaks in the Americas as an example of how a less familiar arbovirus can quickly gain public health relevance [4]. This highlights an important concern: the next arboviral threat may emerge from outside the diseases that already dominate current surveillance.

Preparedness is constrained by operational gaps. Arboviral infections commonly present as undifferentiated febrile illness and are difficult to distinguish clinically from other endemic diseases [7]. Laboratory confirmation is not uniformly available in peripheral settings, and cross-reactivity among flaviviruses complicates interpretation [7]. Therapeutic options are limited, with most infections managed supportively and vaccines available for only a few diseases [4, 7]. Vector control remains the primary preventive strategy but is difficult to sustain in rapidly urbanising environments [4, 7].

Arboviral diseases may not produce pandemics identical to respiratory infections. Even so, they are capable of widespread, multi-country epidemics that occur simultaneously or in succession, placing sustained pressure on health systems [3, 4]. This represents a distinct form of pandemic risk, driven by ecological and vector dynamics rather than direct human transmission.

The implication is clear. Arboviral diseases are recognised within mainstream pandemic preparedness. Strengthening surveillance, improving diagnostic capacity, and sustaining vector control are essential. Without these measures, the current trajectory of expanding transmission is likely to intensify. If present trends continue, arboviral diseases will not remain a peripheral tropical concern but will define the next phase of global epidemic risk.

References

1. World Health Organization. Pathogens prioritization: a scientific framework for epidemic and pandemic research preparedness [Internet]. Geneva: WHO; 2024 [cited 2026 Apr 21]. Available from: https://www.who.int/publications/m/item/pathogens-prioritization-a-scientific-framework-for-epidemic-and-pandemic-research-preparedness
2. World Health Organization. Global Arbovirus Initiative: preparing for the next pandemic by tackling mosquito-borne viruses with epidemic and pandemic potential [Internet]. Geneva: WHO; 2024 [cited 2026 Apr 21]. Available from: https://www.who.int/publications/i/item/9789240088948
3. Allen T, Dadzie SK, Dheerasinghe DSAF, Fall G, Faria NR, Javelle E, *et al.*,. Strengthening global preparedness and response to arboviral disease threats: a call to action. The Lancet Infectious Diseases. 2026; 26 (1) :15-17 . Available from: https://doi.org/10.1016/s1473-3099(25)00686-3
4. World Health Organization. Dengue. Geneva: WHO; 2024. Available at: https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue
5. World Health Organization. Vector-borne diseases [Internet]. Geneva: WHO; 2024 [cited 2026 Apr 21]. Available from: https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases.
6. Varghese J, Silva ID, Millar DS. Latest Advances in Arbovirus Diagnostics. Microorganisms. 2023; 11 (5) :1159 . Available from: https://doi.org/10.3390/microorganisms11051159
7. Ryan SJ, Carlson CJ, Mordecai EA, Johnson ER. Global expansion and redistribution of Aedes-borne virus transmission risk with climate change. PLOS Neglected Tropical Diseases. 2019; 13 (3) :e0007213 . Available from: https://doi.org/10.1371/journal.pntd.0007213
8. Mordecai EA, Ryan SJ, Caldwell JM, Shah MM, LaBeaud AD. Climate change could shift disease burden from malaria to arboviruses in Africa. The Lancet Planetary Health. 2020; 4 (9) :e416-e423 . Available from: https://doi.org/10.1016/s2542-5196(20)30178-9
9. Gupta H, Barde PV, Singh MP, Bharti PK, Nitika. A comprehensive overview of the burden, prevention, and therapeutic aspects of arboviral diseases in India. Communications Medicine. 2025; 5 (1) . Available from: https://doi.org/10.1038/s43856-025-00968-7
10. Pawar N, Seth AK. Chandipura virus in India: A comprehensive epidemiological review. Journal of Vector Borne Diseases. 2025; 62 (4) :391-397 . Available from: https://doi.org/10.4103/jvbd.jvbd_236_24

11. Pandey N, Singh SK. Kyasanur Forest disease: an emerging arboviral threat. The Lancet Infectious Diseases. 2026; 26 (5) :e228-e239 . Available from: https://doi.org/10.1016/s1473-3099(25)00589-4

12. World Health Organization. Prioritizing diseases for research and development in emergency contexts [Internet]. Geneva: WHO; 2024 [cited 2026 Apr 21]. Available from: https://www.who.int/blueprint/priority-diseases/en/.

13. Lim A, Shearer FM, Sewalk K, Pigott DM, Clarke J, Ghouse A *et al*. The overlapping global distribution of dengue, chikungunya, Zika and yellow fever. Nature Communications. 2025; 16 (1) . Available from: https://doi.org/10.1038/s41467-025-58609-5

14. Kraemer MUG, Sinka ME, Duda KA, Mylne AQN, Shearer FM, Barker CM, *et al.*. Author response: The global distribution of the arbovirus vectors Aedes aegypti and Ae. albopictus. 2015; . Available from: https://doi.org/10.7554/elife.08347.014

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