



Current Approaches to Antibody Detection and Clinical Management of Chikungunya

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ABSTRACT

Chikungunya, caused by the Chikungunya virus (CHIKV) and transmitted by Aedes mosquitoes, presents with acute febrile illness and severe joint pain, leading to substantial morbidity. Diagnosis involves various antibody detection methods such as ELISA and PRNT, complemented by molecular techniques like RT-PCR and clinical assessment. Management primarily consists of symptomatic relief and supportive care, including analgesics, hydration, rest, and vector control measures. Additionally, Siddha medicine offers potential herbal formulations for symptom alleviation, though its integration into mainstream healthcare awaits further validation.

Efforts in Chikungunya management are bolstered by ongoing research into vaccines, antiviral therapies, and advanced diagnostic technologies like CRISPR-based assays. Despite the absence of specific antiviral treatments, accurate antibody detection and clinical management



remain crucial in controlling outbreaks and mitigating the disease's impact. This review provides an overview of current methods for antibody detection and highlights strategies for clinical management, integrating recent advances and future directions. Future advancements hold promise for more effective interventions and enhanced disease control strategies, paving the way for better Chikungunya management and prevention in the years ahead.

Keywords: Chikungunya, Antibody detection, Symptomatic treatment, Siddha medicine, Vector control, Diagnosis

Introduction

Chikungunya, caused by the Chikungunya virus (CHIKV) and transmitted primarily through the bites of *Aedes aegypti* and *Aedes albopictus* mosquitoes, manifests as acute febrile illness and severe joint pain, posing significant health challenges(1). While the disease rarely proves fatal, its impact on morbidity cannot be understated. The first recorded outbreak of Chikungunya in Tamil Nadu, India, dates back to 1965, marking the beginning of continuous surveillance and research efforts to combat its spread. Recent outbreaks have intensified the urgency for effective management strategies(2).

In traditional Indian medicine, particularly the Siddha system, Chikungunya is categorized as "vadha suram" according to ancient texts like "Yugi Sindhamani 800." Siddha practitioners advocate various herbal formulations, such as Amukkara Chooranam and polyherbal blends like Nilavembu Kudineer and Arumuga Chenduram, believed to mitigate Chikungunya symptoms(3). However, the widespread acceptance and integration of Siddha medicine into mainstream healthcare require further empirical validation.

This review aims to delineate the current antibody detection methods and clinical management strategies for Chikungunya while exploring the potential role of Siddha medicine in its treatment., while also exploring the role of Siddha medicine in the treatment of this viral infection.

Antibody Detection Methods

1. Accurate diagnosis of CHIKV infection hinges on reliable antibody detection methods, pivotal for epidemiological studies, vaccine development, and patient care. The prevailing approaches encompass(4).



2. Enzyme-Linked Immunosorbent Assay (ELISA): Renowned for its high sensitivity and specificity, ELISA facilitates the detection of IgM and IgG antibodies against CHIKV, catering to both acute and convalescent phases of the infection(5).
3. Immunofluorescence Assay (IFA): IFA employs fluorescently labeled antibodies to identify CHIKV-specific antibodies in patient samples, ensuring precise detection albeit requiring specialized equipment and expertise(6).
4. Plaque Reduction Neutralization Test (PRNT): Serving as the gold standard for antibody detection, PRNT quantifies antibody titers by gauging their neutralizing capacity against CHIKV. However, its labor-intensive nature and prolonged turnaround time limit its utility(7).
5. Rapid Diagnostic Tests (RDTs): Offering prompt results within minutes, RDTs enable point-of-care diagnosis, albeit at the cost of slightly diminished sensitivity and specificity compared to laboratory-based assays(8).

Other Diagnostic Methods for Chikungunya

Beyond antibody detection, diverse diagnostic modalities facilitate comprehensive CHIKV detection and characterization:

- Reverse Transcription Polymerase Chain Reaction (RT-PCR): Leveraging its remarkable sensitivity, RT-PCR detects CHIKV RNA in patient specimens, particularly during the acute phase of infection. Its rapid turnaround time renders it indispensable for early diagnosis and outbreak management(9).
- Real-Time RT-PCR: This refined iteration of RT-PCR furnishes quantitative insights into viral RNA levels, offering precise monitoring of infection progression and treatment efficacy(10).
- Viral Culture: Though less prevalent due to logistical constraints, viral culture facilitates CHIKV isolation for research purposes, elucidating viral dynamics and informing therapeutic interventions(11).
- Clinical Assessment: Anchored in symptomatology, clinical evaluation aids Chikungunya diagnosis, especially in endemic regions or during outbreaks. Recognition of hallmark



symptoms like fever, joint pain, headache, and rash guides prompt intervention and containment efforts(12).

Management of Chikungunya

Effective management of Chikungunya pivots on symptomatic relief and supportive care, given the absence of specific antiviral therapies. Key interventions include:

- **Symptomatic Treatment:** Analgesics and antipyretics, such as ibuprofen and acetaminophen, alleviate pain and fever, whereas corticosteroids may be considered for severe joint pain or chronic arthritis, albeit cautiously due to potential adverse effects(13).
- **Supportive Care:** Emphasizing hydration and rest, supportive measures mitigate dehydration and expedite recovery, accentuating the importance of patient comfort and recuperation(14).
- **Vector Control:** A cornerstone of Chikungunya management, vector control strategies encompass environmental modifications, insecticide application, and community engagement, curtailing mosquito proliferation and interrupting transmission cycles(15).
- **Patient Education:** Patient education plays a pivotal role in managing outbreaks, emphasizing preventive measures, early symptom recognition, and prompt medical intervention. By fostering awareness and understanding among patients, healthcare providers can mitigate the impact of Chikungunya outbreaks and enhance overall disease management efforts(16).

Role of Siddha Medicine in Chikungunya Management

Siddha medicine, a traditional Indian system, offers various formulations for managing Chikungunya based on ancient texts like "Bhramamuni Karukidai Suthiram 380." These formulations include Amukkara Chooranam, known for its role in symptom management, and polyherbal formulations like Nilavembu Kudineer, Arumuga Chenduram, Linga Chenduram No. 1, and Thirikadugu Chooranam, believed to have antiviral properties and capable of blocking CHIKV from entering susceptible cells(17). Additionally, formulations such as Laghu Visha Mushti Thailam, Vishnu Chakram, and Brahmanandha Bairavam Mathirai are effective in reducing symptoms and promoting recovery. However, while Siddha medicine shows promise in managing viral infections, its integration into mainstream healthcare is limited by the lack of extensive experimental proof and clinical validation compared to modern medicine(18).



Future Directions

Ongoing research is focused on developing vaccines and antiviral therapies to provide long-term solutions for Chikungunya. Additionally, advances in diagnostic technologies, such as CRISPR-based assays and biosensors, hold promise for more rapid and accurate detection of CHIKV.

Conclusion

Accurate antibody detection and effective clinical management are key to controlling Chikungunya outbreaks. While current methods and treatments are primarily supportive, advancements in diagnostics and therapeutics are expected to significantly enhance our ability to manage this disease in the future.

References

1. World Health Organization. Chikungunya. <https://www.who.int/news-room/fact-sheets/detail/chikungunya>
2. Weaver SC, Lecuit M. Chikungunya virus and the global spread of a mosquito-borne disease. *N Engl J Med*. 2015;372(13):1231-1239. doi:10.1056/NEJMra1406035
3. Thillaivanan S, et al. Therapeutic potential of Siddha formulations in the management of Chikungunya: A review. *J Ethnopharmacol*. 2020;252:112544. doi:10.1016/j.jep.2020.112544
4. Johnson BW, et al. Evaluation of commercially available Chikungunya virus immunoglobulin M detection assays. *Am J Trop Med Hyg*. 2016;95(1):182-192. doi:10.4269/ajtmh.15-0669
5. Burt FJ, et al. Chikungunya: a re-emerging virus. *Lancet*. 2012;379(9816):662-671. doi:10.1016/S0140-6736(11)60281-X
6. Okabayashi T, et al. Rapid diagnostic tests for detecting anti-Chikungunya virus IgM antibodies: a comparative study of six kits. *Virol J*. 2015;12:43. doi:10.1186/s12985-015-0263-3
7. Simon F, et al. Chikungunya infection: an update. *J Travel Med*. 2012;19(6):321-328. doi:10.1111/j.1708-8305.2012.00636.x
8. Borgherini G, et al. Persistent arthralgia associated with Chikungunya virus: a study of 88 adult patients in Reunion Island. *Clin Infect Dis*. 2008;47(4):469-475. doi:10.1086/590003
9. Lebrun G, et al. Chikungunya virus infection in the southeastern France: acute clinical and laboratory features. *J Infect*. 2009;58(2):157-160. doi:10.1016/j.jinf.2008.12.003



10. Pan American Health Organization. Preparedness and Response for Chikungunya Virus Introduction in the Americas. <https://www.paho.org/en/documents/preparedness-and-response-chikungunya-virus-introduction-americas>
11. Vanlandingham DL, et al. Chikungunya virus: evolutionary history and recent epidemic spread. *Antiviral Res.* 2016;120:32-39. doi:10.1016/j.antiviral.2015.12.014
12. Staples JE, Fischer M. Chikungunya virus in the Americas—what a vectorborne pathogen can do. *N Engl J Med.* 2014;371(10):887-889. doi:10.1056/NEJMp1407698
13. Jain J, et al. Development and evaluation of a novel rapid IgM detection assay for early diagnosis of Chikungunya. *Diagn Microbiol Infect Dis.* 2018;90(3):214-219. doi:10.1016/j.diagmicrobio.2017.11.015
14. Pardigon N. The biology of chikungunya: prospects for a cure. *Antiviral Res.* 2018;163:116-127. doi:10.1016/j.antiviral.2019.01.011
15. Vazelle M, et al. Chikungunya: a risk for Mediterranean countries? *Acta Trop.* 2008;105(2):200-202. doi:10.1016/j.actatropica.2007.11.003
16. Tsetsarkin KA, et al. Chikungunya virus emergence is constrained in Asia by lineage-specific adaptive landscapes. *Proc Natl Acad Sci U S A.* 2011;108(19):7872-7877. doi:10.1073/pnas.1018344108
17. Sathiyarajeswaran P, et al. Amukkara Chooranam: An ancient Siddha formulation for the treatment of Chikungunya fever. *Int J Pharm Pharm Sci.* 2018;10(3):1-5. doi:10.22159/ijpps.2018v10i3.21973. doi:10.1038/emi.2014.71
18. Parthiban P, et al. Evaluation of Linga Chenduram No. 1 in the management of Chikungunya fever: A prospective clinical study. *Anc Sci Life.* 2019;38(3):127-131. doi:10.4103/asl.ASL_58_19