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Short Communication

Regional Variations in Chikungunya Transmission and Chronic Outcomes

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DESCRIPTION

Chikungunya Virus (CHIKV) is an arthropod-borne virus transmitted primarily by *Aedes aegypti* and *Aedes albopictus* mosquitoes. Its infections have been reported in endemic regions and during epidemics in various parts of the world. Understanding the seroprevalence, Force of Infection (FOI) and the prevalence of chronic disabilities post-infection is vital for managing and mitigating its impact.

Overview of chikungunya virus

CHIKV is a single-stranded Ribonucleic acid (RNA) virus of the *Alphavirus* genus. It causes chikungunya fever, characterized by sudden onset of fever, joint pain, rash and other systemic symptoms. While most patients recover within weeks, a subset experiences prolonged or chronic joint pain, leading to significant long-term health burdens. Both endemic and epidemic settings present challenges for public health due to varying transmission dynamics and disease manifestations [1-3].

Methodology for systematic review and meta-analysis

A systematic review and meta-analysis were conducted to synthesize available data on chikungunya seroprevalence, FOI and the prevalence of chronic disability. The study included both endemic and epidemic regions. Articles were selected from scientific databases following rigorous inclusion criteria to ensure the quality and relevance of data. Statistical modeling was employed to estimate FOI and analyze seroprevalence trends. Chronic disability prevalence was assessed through follow-up studies documenting long-term sequelae in affected populations.

Seroprevalence of chikungunya: Seroprevalence studies provide insights into the proportion of the population exposed to CHIKV. Endemic regions exhibit varying levels of seroprevalence based on geographic, climatic and socio-economic factors. In endemic settings, seroprevalence rates are influenced by consistent low-level viral circulation and recurrent mosquito activity. In contrast, epidemic settings demonstrate sharp increases in seroprevalence due to the rapid spread of the virus during outbreaks.

Global estimates indicate seroprevalence rates ranging from 10% to over 60%, depending on the study location and population demographics. For instance, seroprevalence studies in Southeast Asia and the Indian subcontinent reveal rates exceeding 40% in some regions, reflecting intense viral circulation. In contrast, parts of Africa report lower rates, likely due to variations in vector density and environmental factors [4-7].

Force of Infection (FOI): FOI represents the rate at which susceptible individuals acquire infection over time. It is a critical parameter for understanding transmission dynamics and guiding public health interventions. In endemic regions, FOI tends to be steady but influenced by seasonal variations in mosquito populations. Epidemic regions, on the other hand, show a rapid surge in FOI during outbreaks, followed by a decline as herd immunity develops.

Mathematical modeling of FOI based on seroprevalence data indicates higher transmission rates in urbanized areas compared to rural settings, attributable to dense human populations and favorable conditions for vector breeding. Additionally, age-specific FOI analyses highlight that younger populations often exhibit higher rates of recent infection, emphasizing the need for targeted interventions.

Chronic disability post-infection: Chronic disability following chikungunya infection primarily manifests as persistent arthritis or arthralgia, which may last for months or even years. This condition significantly impacts the quality of life and poses a burden on healthcare systems. Studies have documented chronic sequelae in 20% to 40% of individuals post-infection, with varying prevalence based on demographic factors, comorbidities and healthcare access [8-10].

In endemic areas, repeated exposure to the virus does not necessarily increase the risk of chronic symptoms but complicates diagnosis and management. Epidemic regions report higher rates of chronic disability due to the sheer number of cases during

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outbreaks, overwhelming healthcare systems and delaying appropriate management.

Risk factors associated with chronic symptoms include advanced age, pre-existing joint conditions and severe acute-phase symptoms. Furthermore, the socio-economic impact of chronic disability is profound, affecting productivity and increasing dependency on healthcare resources.

Regional comparisons

Regional differences in seroprevalence, FOI and chronic disability prevalence are shaped by ecological, social and healthcare factors. For instance:

Asia: High seroprevalence and FOI rates are observed in urban centers, driven by dense populations and mosquito breeding sites. Chronic disability prevalence is also significant, reflecting gaps in post-acute care.

Africa: Seroprevalence rates vary widely across regions, influenced by vector control measures and climatic conditions. FOI tends to be lower in sparsely populated rural areas.

America: The introduction of CHIKV in the Americas led to widespread epidemics with high seroprevalence in affected regions. Chronic disability rates are comparable to those observed in Asia, highlighting the need for improved long-term care strategies.

Public health implications

The findings from this systematic review underscore the need for integrated vector management and robust surveillance systems. Vaccination strategies, where feasible, could significantly reduce the FOI and subsequent disease burden. Additionally, public health campaigns focusing on reducing mosquito breeding habitats and promoting personal protective measures remain essential in both endemic and epidemic settings.

Long-term management of chronic disabilities requires a multi-disciplinary approach, incorporating rheumatological care, physiotherapy and psychosocial support. Strengthening healthcare infrastructure and ensuring access to affordable treatment options are essential for mitigating the impact of chronic sequelae.

CONCLUSION

Chikungunya remains a significant public health challenge in endemic and epidemic settings. By synthesizing data on seroprevalence, FOI and chronic disability, this study highlights the urgent need for comprehensive strategies to reduce transmission and manage long-term health outcomes. Investments in research, public health infrastructure and community engagement will play a pivotal role in addressing the burden of chikungunya globally.

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