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Prevalence of Chikungunya Infection Activity in Tura, Meghalaya: A Cross-Sectional Study

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Abstract:
Objective: The aim of this study is to study the prevalence of chikungunya infection in Tura, a region in the state of Meghalaya, India.
Methods and Materials: A total number of 72 blood samples from chikungunya suspected patients were collected from the Civil Hospital of Tura in the months of August to October, 2024. Serum separated were subjected to ELISA testing for detection of CHIKV specific IgM.
Results: Out of the 72 samples collected, 15 samples were tested positive by ELISA, giving a positivity of 20.8%. Majority of the positive cases were women and predominantly affecting ages between 18 and 40. Symptoms among the positive cases are mostly fever (100%), headache (60%) while arthralgia (20%) was not seen in all cases.
Conclusion: In this study, it was seen that prevalence of chikungunya infection is almost constant with previously reported years. Being a region that is a hotspot for Aedes mosquitoes, a proper management of vector control is important. In addition, endemic regions require early laboratory diagnosis to avoid any possible outbreaks of arboviruses diseases.

Keywords: Chikungunya infection, CHIKV, Tura, Meghalaya

Key Messages: This study has shown the constant occurrence of chikungunya infection in the region. This calls for a proper management in vector control and efficient laboratory diagnosis to avoid any future outbreaks.

1. INTRODUCTION

Chikungunya fever is caused by “chikungunya virus”, a virus belonging to the Togaviridae family[1]. The term chikungunya was taken from the word “kungunyala” meaning “dry up or contorted” from the Kimakonde language, a language spoken in the Makonde Plateau of South-eastern Tanzania, where it was first officially reported in 1952[2]. This positive-sense single stranded RNA virus is transmitted through the bite of infected Aedes spp. Mosquitoes; *Ae. Aegypti* and *Ae. Albopictus*[2,3]. Three lineages of chikungunya virus have been identified: the Western Africa (WAF), East/Central/Southern Africa (ECSA) and Asian[4]. In India the first significant outbreak was officially reported in 1963 at Kolkata, which then spread to other states in the country[2,5]. Subsequently, numerous sporadic outbreaks continued to be reported. In India there was a pause of chikungunya infection for 32 years, and re-emerges in 2005[2]. Chikungunya infection is characterized by onset of fever after an incubation period of two to six

days, accompanied with headache, fatigue, nausea, rash, vomiting and severe polyarthralgia that can last for five to ten days and sometimes can last for months to years[4,6,7]. Chronic case of chikungunya infection is the development of inflammatory of the joints which lasted for years affecting the mobility of the affected patients[8].

Diagnosis of chikungunya infection is done by ELISA detecting the IgM/IgG antibodies, viral isolation and real-time PCR[2]. The strategy for chikungunya infection is twofold: for serum collected within one to seven days of onset of symptoms, viral genome detection can be done using RT-PCR, and for serum collected after more than five days of onset of symptoms, IgM and/or IgG antibodies can be detected by ELISA. However, a major proportion of infected individuals seek medical attention only after more than five days of infection when viral genome detection is not effective, hence serological technique is widely used as a primary diagnostic confirmation[9].

The northeastern states of India share international borders with Bhutan, Nepal, China, Myanmar, and Bangladesh. Meghalaya, one of the northeastern states of India, shares border with Bangladesh where Chikungunya outbreaks were reported in 2008, 2009, 2012 and again in 2013[10]. In Meghalaya, an outbreak was reported in 2010 in Tura town and no other outbreak were reported since then[10]. The aim of this study is to study the prevalence of chikungunya infection in Tura, West Garo Hills District, Meghalaya.

2. Methodology

2.1.Ethics:

Approval for this study was received from the Ethical Community. All study participants have been informed regarding the study and consent was received from them before sample collection.

2.2.Sample collection:

The study was conducted in Tura, West Garo Hills District, Meghalaya during the months of August to October. Patients with chikungunya-like symptoms presenting in the Civil Hospital located in the district were recruited. Seventy two blood samples were collected during this study period. Serum separated are then stored at -80 freezer.

2.3. Serological Study:

The stored samples were then subjected to IgM ELISA test using the NIV CHIKUNGUNYA IgM Capture ELISA (National Institute of Virology, Pune, Maharashtra, India) by following the manual instructions provided in the Kit.

Samples and the controls (provided with the kit) added to pre-coated Anti-human IgM wells are incubated for one hour. After incubation, each wells were washed five times followed by addition of CHIK antigen (incubation for one hour and wash), then Anti CHIK Monoclonal antibody (incubation for one hour and wash). Avidin-HRP was added with 30 minutes incubation followed by a chromogenic substrate (Tetramethylbenzidine Dichloride), a light sensitive reagent, and was incubated in dark for ten minutes. Finally the reaction is then stopped with 1N H2SO4 solution. The colour intensity was measured at 450 nm.

As per the manual's instruction, result interpretation is as follows:

1. Negative – Sample OD less than OD of NC (Negative Control) X 2.
2. Positive – Sample OD more than OD of NC X 3
3. Equivocal – Sample OD in between the range of OD of NC X 2 and OD of NC X 3

3. Results

Out of 72 samples tested against CHIKV specific IgM antibody with ELISA, 15 samples were positive, giving 20.8% positivity rate for chikungunya infection.

Age-wise distribution of chikungunya infection is predominantly among the age of 18 to 40. While the sex-wise distribution of infection are more in females than in males as seen in the study.

The symptoms among the 15 positive cases are fever (100%), headache (60%), fatigue (46%), arthralgia (20%), myalgia (13%), vomiting (6%) and hyper billirubinemia (6%).

4. Discussion

Disease caused by arboviruses post a great threat to public health, significantly in tropical and sub-tropical areas[11]. The northeastern part of India has high prevalence of CHIKV vectors, i.e Ae. agypti and Ae. Albopictus[7]. Although, Ae. Agypti do not survive well in cold climates but albopictus, a more aggressive and resilient type, can dwell both in rural and urban and can survive in cold climates[12]. Moreover, transmission wise, CHIKV (Chikungunya Virus) and DENV (Dengue Virus) share the same vector and exhibit similar clinical symptoms, therefore making clinical-based diagnosis difficult for either the disease[13,14]. Laboratory confirmation is critical for diagnosis[14]. According to NCVBDC, Meghalaya has reported a 12% prevalence of chikungunya infection in 2023 and 2024 and no confirmed cases of dengue infection[15]. Also, a study from 2023 has shown a prevalence of 10% from a tertiary health center in Meghalaya excluding data from the Garo Hills[1]. A study from 2014 to 2017 has observed a 17.9% prevalence of Chikungunya infection in Tura, a town in Meghalaya[7]. This study has confirmed a prevalence of 20.8%, indicating an almost constant occurrence of chikungunya infection in the state.

Cross- reactivity between CHIKV and DENV serocomplexes has also been reported in other studies[11]. A study by *G. Badoni et al*, has reported 2% cross-reactivity between CHIKV and DENV serocomplexes[16]. The NIV CHIKUNGUNYA IgM Capture ELISA used in this study has sensitivity and specificity of 95% and 98%, however, a study in 2016 by *Abhishek KS and Chakravarti A*, reported a suspicion cross-reactivity of as high as 23.4% with dengue equivocal OD value samples[3]. Therefore, although both the viruses belong to different families a chance of cross-reactivity cannot be omitted[3].

In this study, it was seen that although arthralgia was considered as a typical symptom for chikungunya infection[7], however it was not seen in all the cases. Therefore, without proper laboratory confirmation, clinical diagnosis for chikungunya infection is rather challenging.

Post monsoon is a favourable time for vectors to breed because of water stagnation due to lack of proper rainwater management and also agriculture activities[16]. This part of the country is a hotspot for Aedes mosquitoes making them potential vector for arboviruses[7]. Hence vector control is the primary and important solution against vector borne diseases and to avoid potential epidemics[12]. During the viremic phase, a chance of human to mosquito to human transmission cycle can increase the burden of infection[17]. Therefore, laboratory testing is critical in endemic regions to provide early warning if any viruses are present in the community and to avoid possible outbreaks[18]. No vaccines for chikungunya infection have been approved till date. Chikungunya infectiobns are usually managed with hydration, adequate rest, antipyretics and NSAIDs (Non-steroidal anti-inflammatory drugs)[19].

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