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Spatiotemporal dynamics of Chikungunya and *Dengue virus* transmission in the Arabian Peninsula

The global distribution of mosquito-borne viruses has seen considerable research attention in recent years, particularly about viruses transmitted by *Aedes* mosquitoes. These diseases e.g. dengue (DENV), yellow fever, Chikungunya (CHIKV) and Zika, present serious public health problems, particularly in the light of recent spread events, in which each of the diseases has emerged either in new regions or in new environments. Understanding the spatio-temporal dynamics of endemic infections is of critical importance for a deeper understanding of pathogen transmission, and for the design of more efficient public health strategies. CHIKV and DENV are endemic in the Arabian Peninsula region including Yemen, and the number of reported cases has increased dramatically in the past decade. However, the spatial-temporal dynamics and the potential risk factors in transmission of these viruses have yet to be characterized. A total of 795 suspected cases of CHIKV and DENV reported at the county level between 2012 and 2013 were recruited from 6 hospital centers located in Al Hodeida Governorate in Yemen. Samples were subjected to serological, molecular biology and phylogenetic analysis. Time-series analyses, spatiotemporal cluster analyses, and spatial scan statistics were used to explore the characteristics of the CHIKV and DENV incidence in this region. Our results showed the distribution of cases for Chikungunya and *Dengue virus* infection in relation to time and space. Peaks were observed during the month of February, when the highest number of Chikungunya fever was observed, while the highest absolute number and proportion of Dengue fever was reported in May. A low number of cases were reported in June and January. Phylogenetic and Phylogeographic analysis showed that the Yemen isolates of CHIKV were dated back to the year 2010, whereas DENV isolates were dated back to the year 2003 Burkina Faso strains. The spatiotemporal dynamics of these viruses varied over the study period with high-risk clusters identified in southwest, southern, and middle-eastern parts of Yemen. The risk and endemicity of CHIKV and DENV outbreaks occurs mainly in tropical and subtropical regions. However, these viruses especially *Dengue virus* are now spreading to North America and Europe. Our study sheds light on the global spatiotemporal dynamics of these viruses in one of the countries of Arabian Peninsula that could be targeted with public health interventions to mitigate the growing threat of these viruses. This study reinforces both the need to monitor the spread of CHIKV and DENV, and to apply significant measures for vector control.

Biography

Gamal El Sawaf is a Professor of Microbiology and Immunology Medical Research Institute, Alexandria University, Egypt. He is a nationally recognized leader in infectious diseases. He was graduated from the Faculty of Medicine, Alexandria University in 1979. He has obtained his PhD in 1993 and his Post Doctor training course in the Laboratory of Infectious Diseases (Cattedra Di Clinica Delle Malattie Infettive) University of Rome, Tor Vergata. He was appointed as the Head of Microbiology Department in 2008 and the Director of the Medical Technology Center in 2010 and finally, the Dean of MRI. His main fields of research activities are in the clinical aspects pathogenesis and therapy of HCV, HIV and HHV-8 infection and epidemiology and molecular characterization of hepatitis viruses in Egypt. He has acted as a Referee for a variety of national and international scientific journals and as a Referee of research projects of the Alexandria University and of the STDF projects. He is a Member of the American Society of Microbiology, The Egyptian Society of Microbiology and Egyptian Society of Immunologists. He is a Project Leader of several research programs on HCV, HHV and TB.

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