

Mohammad Fereidouni¹, Dmitry A. Apanaskevich^{2,3}, David B. Pecor^{4,5}, Natalia Yu. Pshenichnaya⁶, Jens H. Kuhn⁷, Maryam Keshtkar-Jahromi⁸

¹Jahrom University of Medical Sciences, Jahrom, Fars Province, 74148-46199, Iran

²U.S. National Tick Collection, The James H. Oliver Jr. Institute for Coastal Plain Science, Georgia Southern University, Statesboro, GA 30458, USA

³Zoological Institute of Russian Academy of Sciences, 199034, St. Petersburg, Russia

⁴Department of Entomology, Walter Reed Biosystematics Unit, Smithsonian Institution, Suitland, MD 20746-2863, USA

⁵Department of Entomology, Walter Reed Army Institute of Research, Silver Spring, MD 20910, USA

⁶Central Research Institute of Epidemiology, 111123, Moscow, Russia

⁷Integrated Research Facility at Fort Detrick, Division of Clinical Research, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Frederick, MD 21702, USA

⁸Division of Infectious Diseases, Department of Medicine, Johns Hopkins University School of Medicine, Baltimore, MD 21205, USA

Introduction

The most common tick-borne arbovirus, Crimean-Congo hemorrhagic fever virus (CCHFV), causes Crimean-Congo hemorrhagic fever (CCHF) with case fatality rate of 5 to 81% but understudied. Considering CCHFV's transmission cycle, it makes sense to conduct one-health surveillance. Hyalomma ticks primarily transmit CCHFV. Transmission can also occur through close contact with an infected person or direct contact with an infected mammal. There is, however, no integration of CCHFV circulation in humans, animals, or ticks in the current maps of disease burden.

Objectives

In light of the increased incidence and distribution of CCHF in Central, Eastern, and South-eastern Asia, in addition to a lack of organized published CCHF-relevant data for these geographical regions, a new map was created by reviewing the literature extensively to highlight countries in need of improved surveillance.

Materials and Methods

We searched Embase, GIDEON, Google Scholar, ProMED, PubMed, Scopus, and Web of Science for any evidence of CCHFV endemicity in Central, Eastern, and South-Eastern Asia (1944–July 2022), followed by searches in national societies, libraries, and publishers' databases specific to each country and language. Furthermore, conference presentations were reviewed if they were indexed. Personal communications with public-health authorities and experts were also considered.

Results

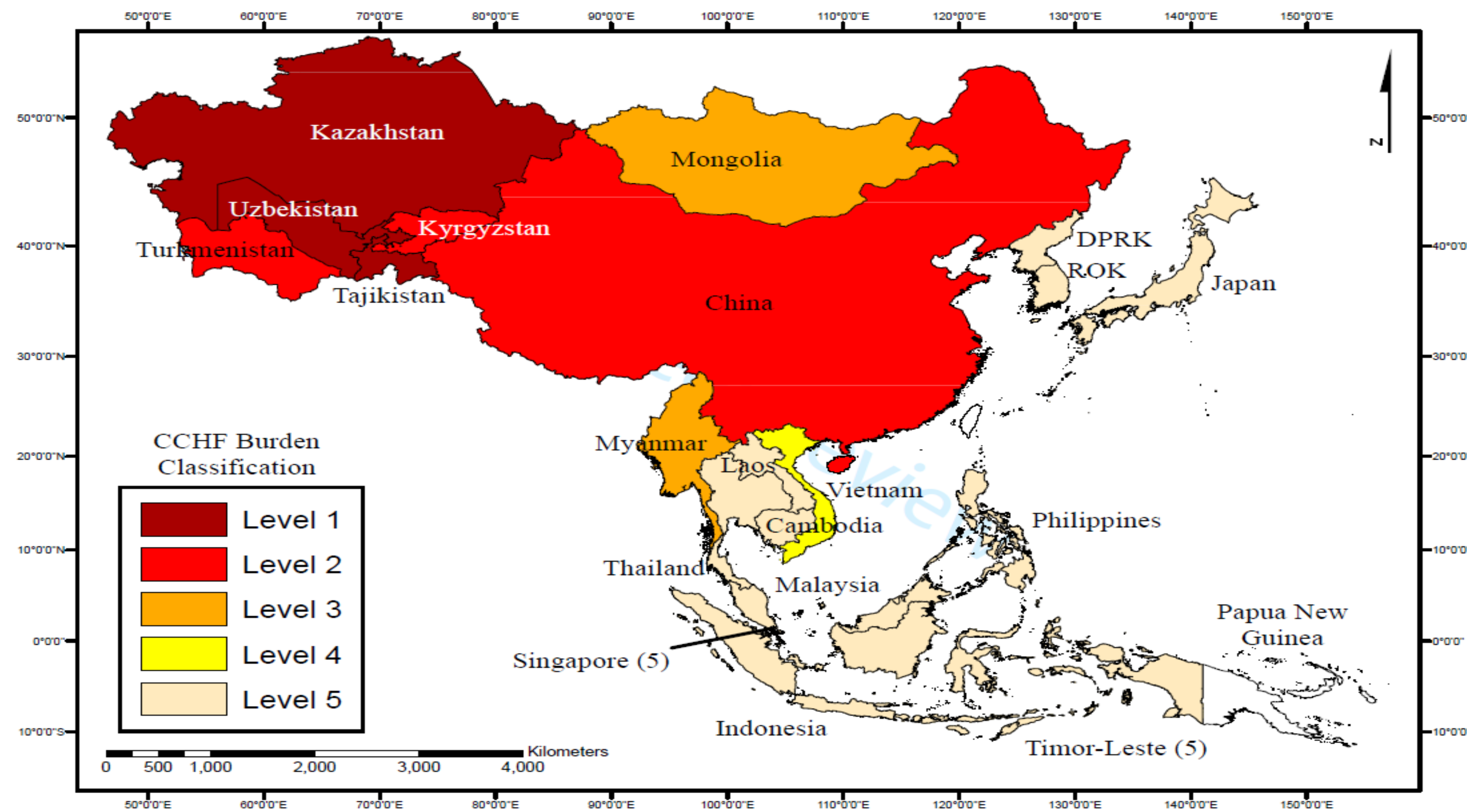


Figure 1- **One Health approach to understanding the burden of CCHF in Central, Eastern, and South-eastern Asia.**

Level 1: CCHF is endemic in these countries with varying surveillance systems.

Level 2: There have been occasional reports of CCHF cases in these countries. Active surveillance systems are essential for identifying hot spots and increasing public awareness.

Level 3: Ecological evidence supporting the circulation of CCHFV, but there have been no reported cases. It is necessary to identify undiagnosed human cases.

Level 4: Hyalomma ticks are the only evidence supporting CCHFV circulation. Serosurveys and tick surveys should be included in future epidemiologic studies.

Level 5: In the absence of available information, further investigation is required to determine whether Hyalomma ticks are present or not.

Classification	Countries
Level 1	Kazakhstan, Tajikistan, Uzbekistan,
Level 2	Kyrgyzstan, Turkmenistan, China
Level 3	Mongolia, Myanmar
Level 4	Viet Nam
Level 5	Brunei Darussalam, Cambodia, Democratic People's Republic of Korea, Indonesia, Japan, Lao People's Democratic Republic, Malaysia, Philippines, Republic of Korea, Singapore, Thailand, Timor-Leste,

Conclusion

During 1944-2021, we identified 2,313 cases of CCHF in the region. The majority of cases were reported by Central Asian countries (2,026). Only China has reported CCHF cases in Eastern and South-eastern Asia (287). Reported CCHF cases, positive human and other animal serology, and the presence of CCHFV tick vector populations were considered supportive evidence of CCHFV endemicity in these regions. Based on these findings, a **One Health** approach can be utilized to assess CCHF endemicity, emergence risk, and country-level priorities, as well as allocate resources to control this potentially fatal virus.