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Letter to the Editor

Surging Oropouche virus (OROV) cases in the Americas: A public health challenge

Dear Editor,

An alert on the surging Oropouche virus (OROV) infection cases in some American countries in recent months was issued by the Pan American Health Organisation (PAHO, WHO) on February 2, 2024 [1]. Identified in Trinidad and Tobago in 1955 for the first time, OROV outbreaks have been reportedly witnessed in Brazil, Colombia, French Guiana, Panamá, Peru, Venezuela, Trinidad and Tobago and Ecuador since then. OROV outbreaks, often linked to midge vector (*Culicoides paraensis*) with sloths and non-human primates as reservoir host, mostly occurred in the urban settings of Amazon basin region (like the Brazilian Amazon) frequently with abundance of insects.

An Arbovirus of genus Orthobunyavirus and family Peribunyaviridae, OROV is frequently reported from Peru and Venezuela (Latin America) and is endemic to Brazil. Its infections in humans, wild animals and vectors in these areas were reported repeatedly in the last two decades [2]. OROV infection is diagnosed early by testing the blood and the cerebrospinal fluid (CSF) of a suspected subject to confirm the viral infection and its invasion in to the central nervous system (CNS) [3,4]. The human-human transmission and OROV-infection mortalities are unconfirmed as there are no such available reports. OROV is an acute febrile illness wherein the infected subject develops signs and symptoms of fever, chills, myalgia and headache. Arthralgia, photophobia, nausea/vomiting and dizziness are other symptoms among the infected. Haemorrhage and meningitis are other complications in OROV infection [5]. OROV infection is self-limiting, and an infected subject recovers in a week. The disease usually remains either undiagnosed (due to its self-limiting and mild manifestations) or misdiagnosed (due to clinical characteristics similar to dengue, chikungunya, zika, yellow fever, malaria, etc.) [6]. OROV fever is spread mostly across the American continent and now expanding its geographic distribution to elsewhere. Surveillance data, and the estimated magnitude and severity of the disease are few, and seem less scientific.

OROV has similar clinical presentation like other arboviral infections. The epidemiological history of OROV and the abundance of the reservoirs and vectors in the American region is a matter of concern. The major limitation in contain OROV is the lack of effective surveillance mechanisms and case reporting. Most of the OROV outbreaks are retrospectively identified through the history of infected people and evaluating the obtained laboratory reports. The awareness about the available laboratory techniques to diagnose OROV is also limited which result in its underdiagnosis and underreporting thereby undermining the scenario of the true prevalence of OROV disease. The ecological cycle of OROV in the wild involves sloths, primates, rodents and birds as natural reservoirs, and *Psorophora cingulata*, *Haemagogus tropicalis*, *Coquillettidia venezuelensis*, *Aedes serratus*, *Culex quinquefasciatus* (of Culicidae family) and *Culicoides* spp. (of Ceratopogonidae family) as mosquito vectors. The infection cycle in humans in urban settings initiates through the bite of these mosquito vectors, and *Culicoides paraensis* is frequently encountered in North and South America.

C. paraensis, as a major vector in the American region, could be instrumental in transmitting OROV to humans. This vector thrives in high temperature and heavy rainfall (high humidity) regions. Deforestation, urbanisation, expanding agricultural land that creates wet and humid conditions and other similar anthropogenic activities facilitate vectors to survive and spread from the environment to humans. Similar high temperature and high humidity factors help the virus to establish in the reservoir hosts thereby completing the transmission cycle. OROV could spread transboundary to regions with weak healthcare facilities, socioeconomically weak and politically disturbed regions, and the regions with complex humanitarian crises due to unsustainable population density, socio-political conflicts, and other sustained instabilities.

A large number of biting midges of genus *Culicoides* and Diptera family (Ceratopogonidae) reportedly occur in various geographical and climate zones. Hundreds of them are found in Neotropics, Brazil and the Brazilian Amazon [2]. Most *Culicoides* biting midges exhibit crepuscular habit and are active during twilights (during dawn and dusk) being hyperactive during the rainy season between 4PM and 6PM. Prevalence of these vectors depends on environmental factors that favour their survival, which include the temperature, humidity, wind and rainfall. A temperature range of 30–32 °C and a relative humidity of 75–85% are the major predictors to capture the highest average insect numbers [2]. Being primarily saprobic, biting midges flourish in locations with decomposing plant material, manure, and wet, muddy and swampy soil. Surveillance data on the hourly and seasonal biting frequency could facilitate intervention measures for vector control.

As a major vector transmitting OROV to humans, *Culicoides paraensis* has a great medical significance. Its sucking habit while biting human, dog and chicken is unique which makes it the most potent vector in OROV transmission. Hence, entomological study to know its preferred habitat favouring its survival tactic and breeding pattern is essential. Knowledge of spatial distribution of vectors and their pathogen-carrying potential could help equip better to tackle an emerging public health threat.

Since there is no therapeutic or preventive antiviral agents to specifically treat and protect against OROV infection, vector control strategies and personal protection measures remain the mainstay to control it. Rapid Risk Assessment (RRA) for public health in the affected American region is suggested. RRA could facilitate evaluating the existing regional risk of spreading of OROV. It would allow identify the risk of OROV infection on public health based on the epidemiological and clinical characteristics like the disease severity indicators and potentially risky ecological factors specific to the region. To manage potential outbreak, RRA could help understand the vector prevalence, improve the surveillance, enhance the diagnostic capabilities and

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facilitate the preparedness of the healthcare system. In view of its continuous emergence, the existing knowledge and gaps of knowledge on OROV fever may be assessed within the 'One Health' concept.

The self-limiting OROV disease lasts for a couple of weeks and its onset is sudden, usually manifested with photophobia, headache, chills, fever, myalgia and arthralgia. Although, the virus becomes viraemic within few days however its diagnosis is usually through serology. As there is no vaccine and as the knowledge of the Oropouche virus cycle is limited, vector control is the best control and prevention strategy. Vector is controlled by identifying and eliminating its growth and resting sites thereby decreasing the mosquito population. *C. paraensis* readily passes through window screens due to its tiny size. Further, the transmission cycle of OROV is not completely understood and the role of non-human primates and birds in supporting the virus spread needs further investigation [7]. Midge vector breeding sites close to human community pose significant OROV infection risk. Control or eradication of arthropod vectors and personal protection measures are the preferred prevention strategies.

CRediT authorship contribution statement

Ranjan K. Mohapatra: Writing – original draft, Supervision, Data curation, Conceptualization. **Snehasish Mishra:** Writing – review & editing, Project administration. **Prakasini Satapathy:** Writing – original draft, Validation. **Venkataramana Kandi:** Writing – original draft, Validation, Data curation. **Lawrence Sena Tuglo:** Writing – original draft, Validation.

Declaration of competing interest

There are no conflicts to declare.

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