

First outbreak of Oropouche in Cuba: epidemiological characterization, 2024

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Research Article

Keywords: Oropouche fever, epidemiology, Cuba

Posted Date: October 7th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11184613/v1>

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Additional Declarations: No competing interests reported.

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Abstract

Background Arthropod-borne viruses represent 39% of all pathogenic viruses identified in humans between 1897 and 2010 and are a major cause of vector-borne diseases. Oropouche virus, an arbovirus associated with acute febrile illness, was historically restricted to the Amazon basin until 2023, when a reassortant lineage expanded throughout Latin America. Since October 2023, this virus has caused a substantial outbreak across the Americas.

Methods This study characterizes Oropouche fever cases diagnosed in Cuba in 2024, considering clinical and epidemiological variables. A retrospective longitudinal descriptive design was used.

Results From epidemiological week (EW) 22 to EW 52 of 2024, 24,259 probable cases were reported (219.9 per 100,000 inhabitants). Of these, 23,633 were suspected cases (214.3 per 100,000) and 626 were confirmed cases, with a cumulative incidence of 5.7 per 100,000 inhabitants. The highest number of confirmed cases (74) occurred in EW 22, corresponding to an incidence of 0.7 per 100,000 inhabitants. All provinces and 124 municipalities (73.8%) reported confirmed cases. Most individuals were females. The age distribution showed a higher concentration among young adults, particularly those aged 20 to 39 years, who represented 25.5% of all cases. More than half of confirmed patients (55.6%) required home admission. A total of 119 confirmed cases presented neurological complications, representing 19.1% of all confirmed infections.

Conclusions The emergence of OROV in Cuba in 2024 resulted in a nationwide outbreak characterized predominantly by mild clinical presentations, although neurological complications were relatively common. These findings highlight the rapid geographic expansion of OROV and underscore the need for strengthened surveillance and diagnostic capacity in the region.

Keywords Oropouche fever, epidemiology, Cuba

Introduction

Vector-borne diseases, including arboviruses, threaten the health and livelihoods of over 80% of the world's population, particularly in tropical and subtropical regions. These diseases cause up to 28.8% of all emerging infectious diseases [1,2]. Arthropod-borne viruses (arboviruses) comprise 39% of all pathogenic viruses discovered in humans between 1897 and 2010, and are a main cause of vector-borne diseases [3].

Oropouche virus (OROV), an arbovirus causing acute febrile illness, was mostly restricted to the Amazon basin until 2023, when a reassortant lineage spread across Latin America. Since October, 2023, OROV has caused a large outbreak of Oropouche fever (ORO fever) in the Americas, exposing yet again the vulnerabilities of infectious disease surveillance systems [4-6].

This virus belongs to the *Peribunyaviridae* family, Orthobunyavirus genus. It is the aetiological agent of Oropouche fever, a zoonotic disease mainly transmitted through both urban cycles (affecting humans) and sylvatic cycles (epizootic). Two vectors are commonly found in urban epidemics: the biting midge *Culicoides paraensis* (*Ceratopogonidae*), and the mosquito *Culex p. quinquefasciatus* (*Culicidae*) [6].

The incubation period of ORO fever; may vary from 4 to 8 days. The acute phase lasts between 5 and 7 days and is characterized by sudden onset acute fever, which is accompanied by headache, arthralgia, myalgia, anorexia, dizziness, chills and photophobia. Some patients present a rash that resembles rubella and nausea, vomiting, diarrhea, conjunctive congestion, epigastric pain and retro-orbital pain, and other systemic manifestations [4,5]. Although 96.0% of cases are self-limiting, severe complications have been reported. Although deaths from this disease had not previously been described, in 2024 two fatal cases were reported in previously healthy young adults infected by the causative virus in the nonendemic region of Bahia, Brazil [6]. Recently, cases of stillbirth, congenital microcephaly and malformation syndromes associated with maternal OROV infection, have been documented suggesting possible vertical transmission [7,8].

The incidence of ORO fever has increased in the last two years. In 2024, cases of local transmission were reported in seven Latin American and Caribbean countries: Brazil, Bolivia, Colombia, Cuba, Guyana, Peru, and the Dominican Republic. In addition, cases of this infection were reported in travelers returning from countries with local transmission to the United States of America, Canada, Spain, Italy, and Germany. In addition, cases of this infection were reported in travelers who returned from countries with local transmission to the United States of America, Canada, Spain, Italy, and Germany [9,10].

On May 27, 2024, the first ORO fever outbreak in Cuba was reported by the Ministry of Public Health [11]. In this context, previous studies have reported relevant findings on clinical and virological characterization of the circulation of the OROV [12,13]. In this study, we describe the characterization of Oropouche fever cases diagnosed in Cuba in 2024 considering different clinical and epidemiological variables.

Materials and Methods

Study design and population

A retrospective longitudinal descriptive study was adopted for this research. This study was approved by the review board of the National Directorate of Epidemiology of the Ministry of Health of Cuba.

The territory of the island of Cuba is made up of 15 provinces and the Special Municipality Isla de la Juventud. Each province is subdivided into municipalities, totaling 168, including the special municipality. The effective Cuban population at the end of 2024 was 9,748,007 inhabitants.

In this longitudinal study, all patients confirmed with ORO fever throughout the country and reported to the national health surveillance system from May 2024 to December of the same year were included for the epidemiological characterization of the first-time circulation of the OROV in Cuba. All cases had a completed case report forms and registered locally in a database with controlled access. Detailed demographic information, epidemiological, and clinical findings were recorded in such case report forms.

Case Definition

Suspected ORO fever case: a person presenting with acute onset fever (or history of fever) of up to 5 days of evolution associated with severe headache and two or more of the following manifestations: myalgia or arthralgia, chills, photophobia, dizziness, retro-orbital pain, nausea, vomiting, or diarrhea and any central nervous system, (meningitis, encephalitis, meningoencephalitis).

Probable ORO fever case: any suspected case that also meets at least one of the following criteria: lives in or has traveled to an area with confirmed transmission of Oropouche cases, has an epidemiological link to a confirmed Oropouche case or has a negative dengue ELISA IgM test result.

Confirmed ORO fever Case: any suspected case with a positive result for OROV detection (viral RNA via RT-qPCR or viral isolation) [14].

Data collection and Variables

We used the number of total cases countrywide of suspected, probable and confirmed ORO fever case per epidemiological week notified in the Notifiable Diseases Information System 2024 and collected from the Health Surveillance Unit of the Ministry of Health from epidemiological week 22 2024 to epidemiological week 52 2024. The data of the total population (9 748 532 inhabitants) was taken from the annual report of the National Office of Statistics and Information.

The variables analyzed included were: age, sex, geographic location, type of admission (home admissions or hospital admissions), clinical presentation and neurological complication.

Statistical analysis

Incidence rates of ORO fever were calculated by dividing national cases and time period by the relevant mid-year population estimate.

The descriptive statistical analysis included examinations of mean, frequencies and percentage. Continuous variable were expressed as median (interquartile range). The information processing was carried out in Excel 2016. Calculations were performed with *R* software v4.2.0 and SPSS 21.0.

Study Oversight

The research we present is part of an approved research project by the Committee of Ethics in Research of the Institute Pedro Kourí, La Habana, Cuba under the protocol number PS241LH005-075.

The research presented did not require review by the Research Ethics Committee because it consists of analysis of data previously collected by the National Office of Statistics and Information.

Results

The notification of ORO fever cases in Cuba began in epidemiological week (EW) 22 of 2024. From EW 22 until EW 52 of 2024, 24,259 probable cases were reported; for a rate of 219.9 per 100,000 inhabitants. Of these, 23,633 were suspected cases, for a rate of 214.3, and 626 were confirmed cases, with a cumulative incidence rate of 5.7 cases per 100,000 inhabitants.

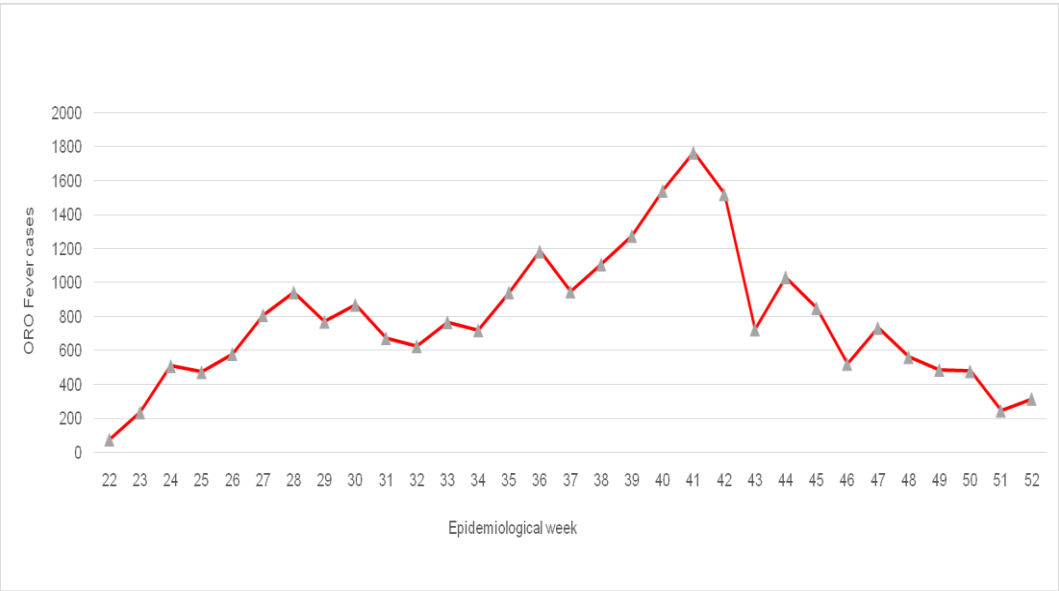
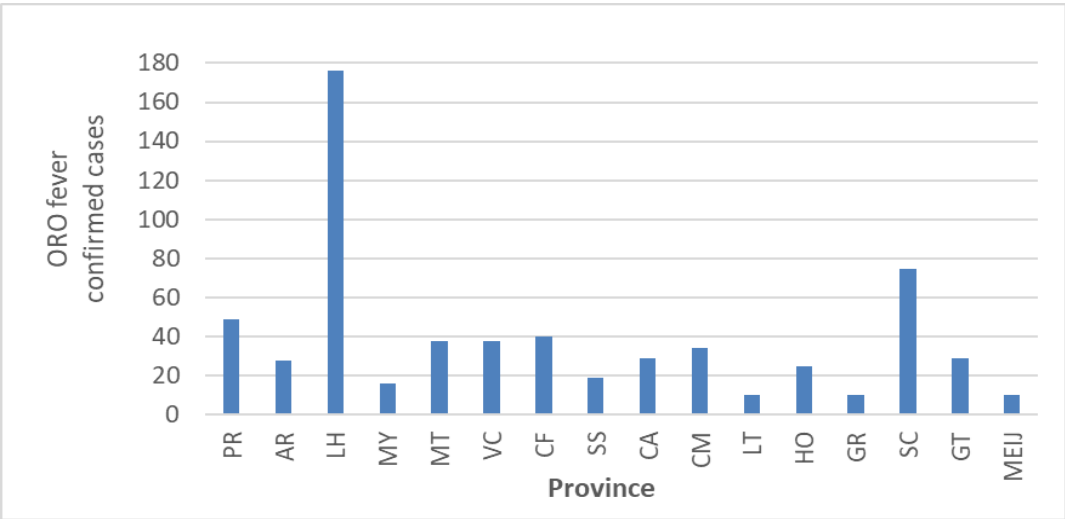


Figure 1. Case Reports of ORO fever by EW, May 2024 to December 2024, Cuba

Figure 1 shows a progressive increase in Oropouche fever cases between epidemiological weeks 22 and 52, reaching a peak in EW 41 (1766 cases). During this period a mean of 782.5 cases per week were registered.

The incidence rates showed a sustained increase from EW 22 (0.78 per 100 000 inhabitants) to reaching values above 10 per 100 000 from EW 36. The maximum value was recorded in EW 41, with a rate of 18.62 per 100 000 inhabitants.

In the analyzed period, all the provinces and 124 municipalities reported ORO fever confirmed cases. (Figure 2) La Habana was the province with the highest number of cases (167), followed by Santiago de Cuba with 70 cases. The rest of the provinces reported between 5 and 41 confirmed cases.



PR: Pinar del Río; AR: Artemisa; LH: La Habana; MY: Mayabeque; MT: Matanzas; CF: Cienfuegos; VC: Villa Clara; SS: Santi Spíritus; CA: Ciego de Ávila; CM: Camagüey; LT: Las Tunas; HO: Holguín; GR: Granma; SC: Santiago de Cuba; GT: Guantánamo; MEIJ: Municipio Especial Isla de la Juventud

Figure 2. Distribution of ORO fever confirmed cases by province, May 2024

The provinces with the highest incidence rate of confirmed cases per 100,000 inhabitants, higher than the national rate, were: Cienfuegos 40 cases and a rate of 10.0; Pinar del Río 49 cases and a rate of 8.6; with 176 cases and a rate of 8.3; Santiago de Cuba 70 cases and a rate of 7.3; Ciego de Ávila 29 cases and a rate of 6.7; Guantánamo with 29 cases and a rate of 5.8; and the Special Municipality Isla de la Juventud with 10 cases and a rate of 12.2.

The main sociodemographic characteristics of the ORO fever cases are described in Table 1. Most individuals were females. The distribution by age group showed a higher concentration among young adults, especially those aged 20 to 39, who represented 25.5% of the total. Those under 15 years of age constituted 24.7%, while adults over 60 years of age represented 15.6% of cases. Regarding the extremes of age, children under 1 year old represented only 1.3%, and those over 85 years old 0.6%, suggesting a limited impact on the most vulnerable age groups.

More than half of confirmed cases of Oropouche fever (55.6%) had home admission with follow-up by the family doctor at the Primary Health Care level, while 44.4% required hospital admission. One hundred percent of children under one year old were admitted to the hospital according to established health protocols. On the other hand, 81.3% of patients aged between 1 and 18 years received health care and follow-up from the family doctor with home admission.

Table 1. Sociodemographic Characteristics of the ORO fever cases, May 2024 to December 2024, Cuba

Characteristics		N	%
Sex	Female	13356	55,1
	Male	10903	44,9
Age	< 1	324	1,3
	1 a 4	1153	4,8
	5 a 9	2000	8,2
	10 a 14	2522	10,4
	15 a 19	2083	8,6
	20 a 39	6177	25,5
	40 a 49	2442	10,1
	50 a 59	3760	15,5
	60 a 69	2312	9,5
	70 a 79	1113	4,6
	80 a 84	221	0,9
	85 y más	152	0,6
Median age (IQR)		33 (10-54)	

IQR, interquartile range

Considering the type of admission of confirmed Oropouche cases by provinces at the end of 2024, it was noted that the highest report of home admission were in the provinces of Santiago de Cuba (100.0%), Ciego de Ávila (96.6%), and Mayabeque (93.8%). Conversely, the provinces of Granma, Havana, and Las Tunas had a higher percentage of hospital admissions with 100.0%, 77.8%, and 70.0%, respectively.

During the analyzed period, a total of 626 confirmed cases were diagnosed: 507 cases of ORO fever and 119 cases with neurological complications (78 GBS, 26 encephalitis, and 15 meningoencephalitis). The overall proportion of neurological complication among the confirmed cases was 19.1%. The province of Villa Clara reported the highest number of cases with neurological clinical forms (n = 20). The most prevalent neurological complications were Guillain-Barré Syndrome (n = 78, 65.5%) followed by encephalitis (n = 26, 21.8%). Except Special Municipality Isla de la Juventud, GBS was reported in all 15 provinces and 46 municipalities (Table 2).

Table 2. Clinical presentation of the ORO fever cases confirmed, May 2024 to December 2024, Cuba

Province	ORO fever	GBS	encephalitis	meningoencephalitis ¹⁷²	GBS:
PR	41	4	3	1	
AR	24	2	1	1	
LH	167	7	1	1	
MY	15	1	0	0	
MT	19	8	11	0	
CF	27	6	4	3	
VC	18	14	0	6	
SS	15	1	3	0	
CA	21	8	0	0	
CM	23	11	0	0	
LT	5	5	0	0	
HO	24	1	0	0	
GR	8	1	1	0	
SC	70	5	0	0	
GT	21	4	2	2	
MEIJ	9	0	0	1	
Total	507	78	26	15	

Guillain-Barré Syndrome.

PR: Pinar del Río; AR: Artemisa; LH: La Habana; MY: Mayabeque; MT: Matanzas; CF: Cienfuegos; VC: Villa Clara; SS: Santi Spíritus; CA: Ciego de Ávila; CM: Camagüey;

LT: Las Tunas; HO: Holguín; GR: Granma; SC: Santiago de Cuba; GT: Guantánamo;
MEIJ: Municipio Especial Isla de la Juventud

Discussion

Oropouche virus disease was the second most common arboviral disease in South America (after dengue) before the emergence of chikungunya and Zika viruses in 2013 and 2015. Prior to late 2023, Oropouche virus disease was reported in Brazil, Bolivia, Colombia, Ecuador, Haiti, Panama, Peru, Trinidad and Tobago, French Guiana and Venezuela. However, since December 2023, there has been an increase in the number of cases reported, including in areas where transmission had not been previously documented [15].

During 2024, locally transmitted ORO fever spread to countries in Latin America and the Caribbean where it had not been previously reported. Additionally, Oropouche virus disease cases were reported among travellers returning from countries with local transmission to the United States, Canada, Spain, Italy and Germany [9,10,16].

In this context, the results of the present study confirm the occurrence in Cuba of the first outbreak of the Oropouche fever based on an analysis of 23,633 suspected cases y 626 confirmed cases in the 15 provinces of the country and the Special Municipality Isla de la Juventud, between EW 22 and 52 of 2024. During an initial phase (epidemiological weeks 22 to 26), case reporting showed rapid growth (from 79 to 579 suspected cases), suggesting the start of community transmission and vector expansion. Between EW 27 and 34, there was an epidemic upswing with suspected cases ranging from 808 to 942, indicating high viral circulation and the consolidation of the outbreak. The highest incidence, where the epidemic peak was identified, occurred between weeks 35-41, attributed to very active transmission, probably favored by environmental conditions and vector density.

Starting the EW 42, the case report steadily decreased, suggesting partial control of the outbreak, a reduction in the susceptible population, or seasonal changes that affect the vector. The epidemiological characteristics identified correspond to a typical epidemic outbreak, whose magnitude (more than 1,700 cases at the peak) shows a high capacity for the spread of the Oropouche virus, consistent with what has been reported in recent outbreaks in the Amazon region [8,17].

Latin America is considered a region with distinctive characteristics that contribute to the emergence of arboviruses. At present, various studies suggest that the rapid expansion of the Oropouche virus in the Americas in 2024 is associated with several factors. Among them, the virological factors (OROVBR-2015–2024 clade as responsible for epidemiological shifts), [8] climate change (shifting climate patterns), [8] human activities (deforestation, infrastructure changes), [17] transmission and vector-host dynamics (emergence of new vector species, increased capacity to infect known vectors) [18,19] and clinical impacts (increased severity and novel clinical presentations) [7,12].

The analysis of the distribution by provinces of the highest incidence rates showed that were reported in the three regions of the country (East, Center, and West). The findings associated with the distribution of

confirmed cases according to the type of admission evidenced the importance of the primary health care level in monitoring cases and controlling the outbreak.

The identification of more cases in females could reflect differences in exposure or in health care-seeking behavior. On the other hand, the higher burden in patients aged 20–39 suggests that transmission affected the economically active and socially mobile population. The finding on a significant proportion of children under 15 were affected suggests household or community transmission associated with the vector that reaches children. The low proportion in those under 1 and over 85 suggests limited impact on the most vulnerable groups, although this should be interpreted cautiously. Additional studies, such as exposure surveys and seroepidemiological studies to estimate population immunity, could help clarify these findings.

The presence of complications associated with OROV infection was more frequent at the extreme ages of life (under 1 year old and patients 65 years and older). Although there is no consensus regarding OROV infection risk by sex or age, studies suggest that younger individuals are more susceptible due to the lack of prior exposure [4, 20, 21].

A result to highlight in this study is related to the presence of different neurological complications in the course of Oropouche fever. Among them, the most frequent was Guillain-Barré Syndrome. Two recent studies have conducted analyses on this unusual association not previously described [8, 22].

Traditionally, Oropouche fever clinically presents as a self-limiting disease. Studies reveal new findings on OROV virulence and pathogenesis [23]. Recent outbreaks have shown more severe clinical forms of ORO fever and new forms of transmission [24, 25]. These reports have highlighted the need to do new and comprehensive investigations into the roles of the various factors involved in the clinical and epidemiological context of Oropouche fever in recent years.

The detection of the circulation of OROV nationally highlights the need to strengthen the integrated surveillance of arboviruses. Regional cooperation, the implementation of a national plan to confront arboviral diseases were decisive for controlling the outbreak and for making contributions to global efforts against emerging arboviral threats.

In conclusion, in Cuba in 2024 the emergence of the OROV caused an outbreak that affected all the provinces with a predominantly mild clinical courses and neurological complications were frequent. Additional studies are needed to fully understand the epidemiology and pathogenesis of this virus.

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Statements and Declarations

Declaration of conflicting interests

323 The authors declared no potential conflicts of interest with respect to the research, authorship, and/or
324 publication of this article.

325 **Funding**

326 The authors received no financial support for the research, authorship, and/or publication of this article.

327 **Competing Interests**

328 The authors have no relevant financial or non-financial interests to disclose

329 **Author Contributions**

330 All authors (JRAF, CEPG, BAH, YON, RYRC, JNS,VKC, MGGT) contributed to the study
331 conceptualization and design. Methodology, material preparation, data collection, formal analysis and
332 interpretation were performed by (JRAF,CEPG, BAH, YON, RYRC, JNS). The first draft of the manuscript
333 was written by (JRDF AND BAH). All authors commented on previous versions of the manuscript through
334 critical review. All authors read and approved the final version manuscript.

335 **Data Availability Statement**

336 Data are available upon request to the corresponding author.

337 **Ethics approval**

338 The authors ensure that the work described has been carried out adhered to the current revision of the
339 Declaration of Helsinki (2024), the data protection regulations and the confidentiality of the results was
340 ensured. At the same time, all procedures were performed in compliance with relevant laws and institutional
341 guidelines and have been approved by the ethical institutional 06/06/24 Ref: 128.