INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN BIOLOGY AND MEDICINE
ISSN: 2455-944X
www.darshanpublishers.com
Volume 3, Issue 10 - 2018

Review Article

DOI: http://dx.doi.org/10.22192/ijcrbm.2018.03.10.003

Chikungunya Virus: An Infectious Disease

Ashikujaman Syed,
China Pharmaceutical University, Nanjing; Jiangsu, China.
E-mail: *ashik@stu.cpu.edu.cn*

Abstract

Chikungunya (pronunciation: chik-en-gun-ye) virus is transmitted to people by mosquitoes. The most common symptoms of chikungunya virus infection are fever and joint pain. Other symptoms may include headache, muscle pain, joint swelling, or rash. Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans. In late 2013, chikungunya virus was found for the first time in the Americas on islands in the Caribbean. There is a risk that the virus will be imported to new areas by infected travelers. There is no vaccine to prevent or medicine to treat chikungunya virus infection. Travelers can protect themselves by preventingmosquito bites. When traveling to countries with chikungunya virus, use insect repellent, wear long sleeves and pants, and stay in places with air conditioning or that use window and door screens.

Keywords: Chikungunya Virus, Prevention, Transmission, Symptoms and Treatment, Geographic Distribution, for health care providers, New cast for the United States, Resources

Introduction

Chikungunya fever and virus is an acute febrile illness associated with severe, often debilitating polyarthralgias. The disease is caused by Chikungunya virus (CHIKV), an arthropod-borne virus that is transmitted to humans primarily via the bite of an infected mosquito. Since a re-emergence of CHIKV in 2004, the virus has spread into novel locations, such as Europe, and has led to millions of cases of disease throughout countries in and around the Indian Ocean. The risk of importation of CHIKV into new areas is ever present because of the high attack rates associated with the recurring epidemics, the high levels of viremia in infected humans, and the worldwide distribution of the vectors responsible for transmitting CHIKV. In this review, we will characterize the epidemiology and global expansion of CHIKV, describe the clinical features and laboratory testing for the disease, and discuss priorities for further studies needed for effective disease control and prevention.

Prevention Chikungunya virus:-

No vaccine exists to prevent chikungunya virus infection or disease. The most effective way to avoid chikungunya virus infection is to prevent mosquito bites. The mosquitoes that spread the chikungunya virus bite during the day and at night. Prevent Mosquito Bites:

Use Insect Repellent:-

Use Environmental Protection Agency (EPA)-registered insect repellents with one of the active ingredients below. When used as directed, EPA-registered insect repellents are proven safe and effective, even for pregnant and breastfeeding women.

DEET
Picaridin (known as KBR 3023 and icaridin outside the US)
IR3535
Oil of lemon eucalyptus (OLE) or para-menthane-diol (PMD)

Tips for Everyone:-

Always follow the product label instructions.
Reapply insect repellent as directed.
Do not spray repellent on the skin under clothing.

If you are also using sunscreen, apply sunscreen first and insect repellent second.

Tips for Babies & Children:-

Always follow instructions when applying insect repellent to children.
Do not use insect repellent on babies younger than 2 months old.
Do not apply insect repellent onto a child's hands, eyes, mouth, and cut or irritated skin.
Adults: Spray insect repellent onto your hands and then apply to a child's face.
Do not use products containing oil of lemon eucalyptus (OLE) or para-menthane-diol (PMD) on children under 3 years old.

Natural insect repellents (repellents not registered with EPA)

We do not know the effectiveness of non-EPA registered insect repellents, including some natural repellents.

To protect yourself against diseases spread by mosquitoes, CDC and EPA recommend using an EPA-registered insect repellent.

Choosing an EPA-registered repellent ensures the EPA has evaluated the product for effectiveness.

Protect your baby or child

Dress your child in clothing that covers arms and legs.

Cover crib, stroller, and baby carrier with mosquito netting.

Wear long-sleeved shirts and long pants

Treat items, such as boots, pants, socks, and tents, with permethrin* or buy permethrin-treated clothing and gear.

Permethrin-treated clothing will protect you after multiple washings. See product information to find out how long the protection will last.

If treating items yourself, follow the product instructions.

Do not use permethrin products directly on skin.

In some places, such as Puerto Rico, where permethrin products have been used for years in mosquito control efforts, mosquitoes have become resistant to it. In areas with high levels of resistance, use of permethrin is not likely to be effective.

Take steps to control mosquitoes inside and outside your home
Use screens on windows and doors. Repair holes in screens to keep mosquitoes outside.
Use air conditioning when available.
Sleep under a mosquito bed net if air conditioned or screened rooms are not available or if sleeping outdoors.

Once a week, empty and scrub, turn over, cover, or throw out items that hold water, such as tires, buckets, planters, toys, pools, birdbaths, flowerpots, or trash containers. Check inside and outside your home. Mosquitoes lay eggs near water.
If you have chikungunya, follow these instructions:
During the first week of infection, chikungunya virus can be found in the blood and passed from an infected person to another mosquito through mosquito bites. An infected mosquito can then transmit the virus to other people.To prevent further spread of the virus, it is important for people to avoid mosquito bites during the first week of illness.

Transmission:- Through mosquito bites

Chikungunya virus is transmitted to people through mosquito bites. Mosquitoes become infected when they feed on a person already infected with the virus. Infected mosquitoes can then spread the virus to other people through bites.

Chikungunya virus is most often spread to people by *Aedes aegypti* and *Aedes albopictus* mosquitoes. These are the same mosquitoes that transmit dengue virus. They bite during the day and at night. *Aedes* mosquitoes transmit chikungunya virus to people. These types of mosquitoes are found throughout much of the world. Rarely, from mother to child

Chikungunya virus is transmitted rarely from mother to newborn around the time of birth.
To date, no infants have been found to be infected with chikungunya virus through breastfeeding. Because of the benefits of breastfeeding, mothers are encouraged to breastfeed even in areas where chikungunya virus is circulating.

Rarely, through infected blood

In theory, the virus could be spread through a blood transfusion. To date, there are no known reports of this happening. Symptoms, Diagnosis, & Treatment:-

Symptoms

Most people infected with chikungunya virus will develop some symptoms.
Symptoms usually begin 3–7 days after being bitten by an infected mosquito.
The most common symptoms are fever and joint pain.
Other symptoms may include headache, muscle pain, joint swelling, or rash.
Chikungunya disease does not often result in death, but the symptoms can be severe and disabling.
Most patients feel better within a week. In some people, the joint pain may persist for months.
People at risk for more severe disease include newborns infected around the time of birth, older adults (≥65 years), and people with medical conditions such as high blood pressure, diabetes, or heart disease.
Once a person has been infected, he or she is likely to be protected from future infections.

Diagnosis

The symptoms of chikungunya are similar to those of dengue and Zika, diseases spread by the same mosquitoes that transmit chikungunya.
See your healthcare provider if you develop the symptoms described above and have visited an area where chikungunya is found.
If you have recently traveled, tell your healthcare provider when and where you traveled.
Your healthcare provider may order blood tests to look for chikungunya or other similar viruses like dengue and Zika.

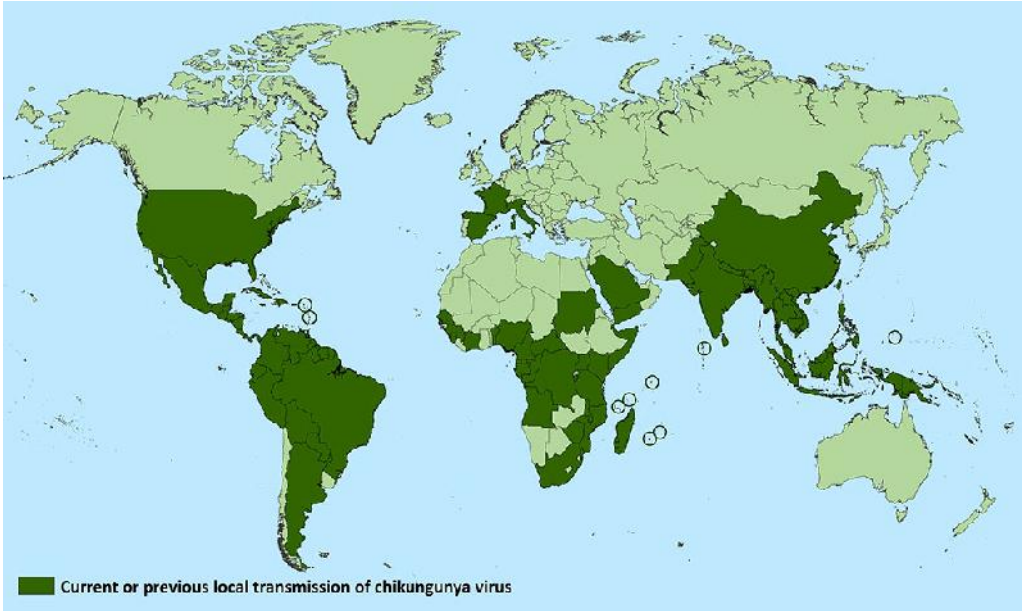
Treatment

There is no vaccine to prevent or medicine to treat chikungunya virus.

Treat the symptoms:

Get plenty of rest.
Drink fluids to prevent dehydration.
Take medicine such as acetaminophen (Tylenol®) or paracetamol to reduce fever and pain.
Do not take aspirin and other non-steroidal anti-inflammatory drugs (NSAIDS until dengue can be ruled out to reduce the risk of bleeding).
If you are taking medicine for another medical condition, talk to your healthcare provider before taking additional medication.
If you have chikungunya, prevent mosquito bites for the first week of your illness.
During the first week of infection, chikungunya virus can be found in the blood and passed from an infected person to a mosquito through mosquito bites.
An infected mosquito can then spread the virus to other people.

Geographic Distribution:- Where Has Chikungunya Virus Been Found?



Africa

- Angola
- Benin
- Burundi
- Cameroon
- Central African Republic
- Comoros
- Cote d'Ivoire
- Democratic Republic of the Congo
- Djibouti
- Equatorial Guinea
- Gabon
- Guinea
- Kenya
- Madagascar
- Malawi
- Mauritius
- Mayotte
- Mozambique
- Nigeria
- Republic of the Congo
- Reunion
- Senegal
- Seychelles
- Sierra Leone
- South Africa
- Somalia
- Sudan
- Tanzania
- Uganda
- Zimbabwe

Asia

- Bangladesh
- Bhutan
- Cambodia
- China
- India
- Indonesia
- Laos
- Malaysia
- Maldives
- Myanmar (Burma)
- Nepal
- Pakistan
- Philippines
- Saudi Arabia
- Singapore
- Sri Lanka
- Thailand
- Timor-Leste
- Vietnam
- Yemen

Europe

- France
- Italy
- Spain

Americas

- Anguilla
- Antigua and Barbuda
- Argentina
- Aruba
- Bahamas
- Barbados
- Belize
- Bolivia
- Brazil
- British Virgin Islands
- Cayman Islands
- Colombia
- Costa Rica
- Cuba
- Curacao
- Dominica
- Dominican Republic
- Ecuador
- El Salvador
- French Guiana
- Grenada
- Guadeloupe
- Guatemala
- Guyana
- Haiti
- Honduras
- Jamaica
- Martinique
- Mexico

- Montserrat
- Nicaragua
- Panama
- Paraguay
- Peru
- Puerto Rico
- Saint Barthelemy
- Saint Kitts and Nevis
- Saint Lucia
- Saint Martin
- Saint Vincent and the Grenadines
- Sint Maarten
- Suriname
- Trinidad and Tobago
- Turks and Caicos Islands
- United States
- US Virgin Islands
- Venezuela

Oceania/pacific islands

- American Samoa
- Cook Islands
- Federal States of Micronesia
- Fiji
- French Polynesia
- Kiribati
- Marshall Islands
- New Caledonia
- Papua New Guinea
- Samoa
- Tokelau
- Tonga

Chikungunya virus in the United States:-

2018 provisional data for the United States-Chikungunya virus disease became a nationally notifiable condition in 2015. Cases are reported to CDC by state and local health departments using standard case definitions.

As of July 10, 2018, a total of 22 chikungunya virus disease cases with illness onset in 2018 have been reported to ArboNET from 13 U.S. states (Table & Map). All reported cases occurred in travelers returning from affected areas. No locally-transmitted cases have been reported from U.S. states.

A total of zero chikungunya virus disease cases with illness onset in 2018 have been reported to ArboNET from U.S. territories (Table).

States reporting chikungunya virus disease cases – United States, 2018 (as of July 10, 2018)-

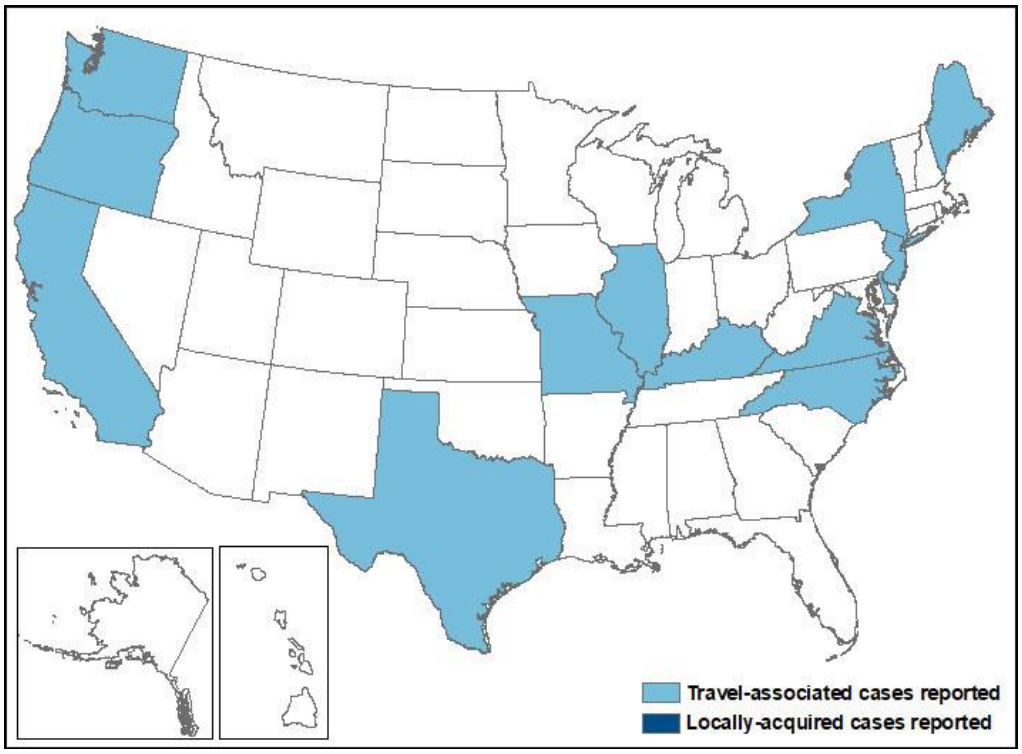


Table. Laboratory-confirmed chikungunya virus disease cases reported to ArboNET by state or territory — United States, 2018 (as of July 10, 2018)

	Travel-associated cases No. (%)	Locally-transmitted cases No. (%)
State	(N=22)	(N=0)
California	**1 (5)**	**0 (0)**
Delaware	**1 (5)**	**0 (0)**
Illinois	**1 (5)**	**0 (0)**
Kentucky	**1 (5)**	**0 (0)**
Maine	**1 (5)**	**0 (0)**
Missouri	**1 (5)**	**0 (0)**
New Jersey	**3 (14)**	**0 (0)**
New York	**5 (23)**	**0 (0)**
North Carolina	**1 (5)**	**0 (0)**
Oregon	**1 (5)**	**0 (0)**
Texas	**4 (18)**	**0 (0)**
Virginia	**1 (5)**	**0 (0)**
Washington	**1 (5)**	**0 (0)**
Territories	(N=0)	(N=0)

- Page last reviewed: July 10, 2018
- Page last updated: July 10, 2018
- Content source:

o Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases (NCEZID)
Division of Vector-Borne Diseases (DVBD)

Information For Health Care Providers:-

Clinical Evaluation & Disease: Modes of Transmission-

Chikungunya virus is primarily transmitted to humans through the bites of infected mosquitoes, predominantly *Aedes aegypti* and *Aedes albopictus*. Humans are the primary host of chikungunya virus during epidemic periods. Blood-borne transmission is possible; cases have been documented among laboratory personnel handling infected blood and a health care worker drawing blood from an infected patient. Rare in utero transmission has been documented mostly during the second trimester. Intrapartum transmission has also been documented when the mother was viremic around the time of delivery. Studies have not found chikungunya virus in breast milk and there have been no reports to date of infants acquiring chikungunya virus infection through breastfeeding. Because the benefits of breastfeeding likely outweigh the risk of chikungunya virus infection in breastfeeding infants, mothers should be encouraged to breastfeed even if they are infected with chikungunya virus or live in an area with ongoing virus transmission.

The risk of a person transmitting the virus to a biting mosquito or through blood is highest when the patient is viremic during the first week of illness.

Clinical Signs & Symptoms-

The majority of people infected with chikungunya virus become symptomatic. The incubation period is typically 3–7 days (range, 1–12 days). The disease is most often characterized by acute onset of fever (typically >39°C [102°F]) and polyarthralgia. Joint symptoms are usually bilateral and symmetric, and can be severe and debilitating. Other symptoms may include headache, myalgia, arthritis, conjunctivitis, nausea/vomiting, or maculopapular rash. Clinical laboratory findings can include lymphopenia, thrombocytopenia, elevated creatinine, and elevated hepatic transaminases. Acute symptoms typically resolve within 7–10 days. Rare complications include uveitis, retinitis, myocarditis, hepatitis, nephritis, bullous skin lesions, hemorrhage, meningoencephalitis, myelitis, Guillain-Barré syndrome, and cranial nerve palsies. Persons at risk for severe disease include neonates exposed intrapartum, older adults (e.g., > 65 years), and persons with underlying medical conditions (e.g., hypertension, diabetes, or cardiovascular disease). Some patients might have relapse of rheumatologic symptoms (e.g., polyarthralgia, polyarthritis, tenosynovitis) in the months following acute illness. Studies report variable proportions of patients with persistent joint pains for months to years. Mortality is rare and occurs mostly in older adults.

Diagnosis & Reporting:-

Chikungunya virus infection should be considered in patients with acute onset of fever and polyarthralgia, especially travelers who recently returned from areas with known virus transmission.

The differential diagnosis of chikungunya virus infection varies based on place of residence, travel history, and exposures. Dengue and chikungunya viruses are transmitted by the same mosquitoes and have similar clinical features. The two viruses can circulate in the same area and can cause occasional co-infections in the same patient. Chikungunya virus infection is more likely to cause high fever, severe arthralgia, arthritis, rash, and lymphopenia, while dengue virus infection is more likely to cause neutropenia, thrombocytopenia, hemorrhage, shock, and death. It is important to rule out dengue virus infection because proper clinical management of dengue can improve outcome. In addition to dengue, other considerations include leptospirosis, malaria, rickettsia, group A streptococcus, rubella, measles, parvovirus, enteroviruses, adenovirus, other alphavirus infections (e.g., Mayaro, Ross River, Barmah Forest, O'nyong-nyong, and Sindbis viruses), post-infections arthritis, and rheumatologic conditions.

Preliminary diagnosis is based on the patient's clinical features, places and dates of travel, and activities. Laboratory diagnosis is generally accomplished by testing serum or plasma to detect virus, viral nucleic acid, or virus-specific immunoglobulin M and neutralizing antibodies. Chikungunya virus disease is a nationally notifiable condition. Healthcare providers are encouraged to report suspected chikungunya cases to their state or local health department to facilitate diagnosis and mitigate the risk of local transmission.

Treatment:-

There is no specific antiviral therapy for chikungunya virus infection. Treatment is for symptoms and can include rest, fluids, and use of non-steroidal anti-inflammatory drugs (NSAIDs) to relieve acute pain

and fever. Persistent joint pain may benefit from use of NSAIDs, corticosteroids, or physiotherapy. People infected with chikungunya should be protected from further mosquito exposure during the first week of illness to reduce the risk of local transmission.

Diagnostic Testing:-

Where can I order chikungunya virus testing? Diagnostic testing is available through a few commercial laboratories, many state health departments, and the Centers for Disease Control and Prevention. Contact your state health department for more information and to facilitate testing.

Chikungunya virus infection should be considered in patients with acute onset of fever and polyarthralgia, especially travelers who recently returned from areas with known virus transmission.
Laboratory diagnosis is generally accomplished by testing serum or plasma to detect virus, viral nucleic acid, or virus-specific immunoglobulin (Ig) M and neutralizing antibodies. Viral culture may detect virus in the first 3 days of illness; however, chikungunya virus should be handled under biosafety level (BSL) 3 conditions. During the first 8 days of illness, chikungunya viral RNA can often be identified in serum. Chikungunya virus antibodies normally develop toward the end of the first week of illness. Therefore, to definitively rule out the diagnosis, convalescent-phase samples should be obtained from patients whose acute-phase samples test negative.

What type of tube should I collect blood in?

The best type of tube is serum separator (typically tiger/speckled-top). The blood should be allowed to coagulate and tubes should be spun to separate the serum from the clot prior to shipping.

If a red-top is used (no additive), the blood must be allowed to coagulate, the tube centrifuged, and the serum drawn off into a clean tube prior to shipping. Heparin (green top) and EDTA (purple top) are unsuitable for CHIK testing. Where and how should I send the samples to CDC? Please note: because chikungunya virus testing is not listed in the drop-down menu for the Test Order Name field of form 50.34 (located on 1st page, top left), you will need to select “ARBOVIRUS SEROLOGY” and then type “CHIK testing” in the Brief Clinical Summary field located at the top of the second page of the form. When will results be available?

Test results are normally available 4 to 14 days after specimen receipt. Reporting times for test results may be longer during summer months when arbovirus activity increases. Receipt of a hard copy of the results will take at least 2 weeks after testing is completed. Initial serological testing will be performed using IgM-capture ELISA and IgG ELISA. If the initial results are positive, further confirmatory testing will be performed and it may delay the reporting of final results.

ALL RESULTS WILL BE SENT TO THE APPROPRIATE STATE HEALTH DEPARTMENT. Notify your state health department of any direct submissions to CDC.

Resources for Healthcare Providers:- CHIKUNGUNYA Clinical management in dengue-endemic areas- Clinical findings • Acute onset of fever and polyarthralgia are the primary clinical findings • Joint symptoms usually symmetric and often occur in hands and feet • Other symptoms: Headache, myalgia, arthritis, conjunctivitis, nausea/vomiting, or maculopapular rash • Lymphopenia, thrombocytopenia, elevated creatinine, and elevated hepatic transaminases are the most common clinical laboratory findings • Mortality rare but joint symptoms can be severe and debilitating. Chikungunya and dengue:- • Difficult to distinguish chikungunya and dengue based on clinical findings alone • Chikungunya and dengue viruses transmitted by the same mosquitoes • The viruses can circulate in the same area and cause occasional co-infections in the same patient • Chikungunya virus more likely to cause high fever, severe polyarthralgia, arthritis, rash, and lymphopenia • Dengue virus more likely to cause neutropenia, thrombocytopenia, hemorrhage, shock, and death • Patients with suspected chikungunya should be managed as dengue until dengue has been ruled out o Proper clinical management of dengue reduces the risk of medical complications and death o Aspirin and other NSAIDs can increase the risk of hemorrhage in patients with dengue. Chikungunya Atypical and severe disease manifestations - Atypical and severe manifestations • Although most chikungunya virus infections result in fever and arthralgia, other clinical manifestations can occur. • Atypical or severe clinical manifestations can be due to the direct effects of the virus, immunologic response to the virus, drug toxicity, or diseases unrelated to chikungunya virus infection. • Some atypical or severe manifestations are more common in certain groups. For example, vesiculobullous lesions, febrile seizures, and meningoencephalitis have been reported in infants and young children. • Since many atypical and severe clinical manifestations will be unrelated to chikungunya virus infection, healthcare providers should consider and evaluate for other etiologies. Reported atypical or severe disease manifestations of chikungunya virus infection System Clinical manifestations - 1. Neurological : Meningoencephalitis, encephalopathy, seizures, Guillain-Barré syndrome, cerebellar syndrome, paresis, palsies, neuropathy. 2. Ocular Optic neuritis, iridocyclitis, episcleritis, retinitis, uveitis. 3. Cardiovascular Myocarditis, pericarditis, heart failure, arrhythmias, hemodynamic instability. 4. Dermatological Photosensitive hyperpigmentation, intertriginous aphthous-like ulcers, vesiculobullous dermatosis. 5. Renal Nephritis, acute renal failure. 6. Other Bleeding dyscrasias, pneumonia, respiratory failure, hepatitis, pancreatitis, syndrome of inappropriate secretion of antidiuretic hormone (SIADH), hypoadrenalism. Risk groups for severe disease • Persons at risk for severe disease (e.g., hospitalization) include neonates exposed intrapartum, older adults, and persons with underlying medical conditions (e.g., hypertension, diabetes, cardiovascular disease). • Mortality is rare and occurs mostly in older adults. Pregnant women and newborns • Pregnant women infected with chikungunya virus are not at increased risk of atypical or severe disease. • Most pregnant women infected with chikungunya virus do not transmit the virus to the fetus. • The highest risk occurs when pregnant women are symptomatic during the intrapartum period (i.e., 2 days before to 2 days after delivery). During the intrapartum period, half of all infected pregnant women will transmit chikungunya virus to their fetus. • Infants infected intrapartum are often asymptomatic at birth but most develop clinical illness within 7 days after delivery. • Common symptoms among neonates include fever, pain, rash, and peripheral edema. Some infants develop neurologic disease (e.g., meningoencephalitis, cerebral edema, intracranial hemorrhage), hemorrhagic symptoms, or myocardial disease. • Laboratory abnormalities include elevated liver function tests, reduced platelet and lymphocyte counts, and increased prothrombin time. • Neonates who suffer from neurologic disease often develop long-term disabilities. • There is no evidence that chikungunya virus is transmitted through breast milk. Treatment and clinical management • Since no specific antiviral therapy is available, treatment is symptomatic • Assess hydration and hemodynamic status • Provide supportive care as needed and manage complications • Evaluate for other serious conditions (e.g., dengue, malaria, bacterial infection) and treat or manage appropriately • Use acetaminophen or paracetamol for fever and pain control o If inadequate, consider using narcotics or NSAIDs o If the patient is suspected of having dengue, do not use aspirin or other NSAIDs (e.g., ibuprofen, naproxen, toradol) until the patient has been afebrile ≥48 hours and does not have warning signs for severe dengue.

Additional Resources:

CDC Press Release (December 18, 2013): First Reports of Chikungunya in Western Hemisphere
CDC Health Advisory (December 13, 2013): Notice to Public Health Officials and Clinicians: Recognizing, Managing, and Reporting Chikungunya Virus Infections in Travelers Returning from the Caribbean
Chikungunya in the Americas updates (Pan American Health Organization)
Guidelines for Preparedness and Response for Chikungunya Virus Introduction in the Americas [PDF – 161 pages] (from the Pan American Health Organization and CDC) *English*
Guidelines for Preparedness and Response for Chikungunya Virus Introduction in the Americas [PDF – 159 pages] (from the Pan American Health Organization and CDC) *Spanish*
Chikungunya virus: An emerging threat to the Americas (CDC Clinician Outreach and Communication Activity webinar)
Chikungunya Fever, A Re–emerging Disease in Asia (from the World Health Organization)
Chikungunya fact sheets: Communication Tool Kit (from the European Centre for Disease Prevention and Control)

Recent Publications:

Gibney KB, Fischer M, Prince HE, Kramer LD, St George K, Kosoy OL, Laven JJ, Staples JE. Chikungunya fever in the United States: a fifteen year review of cases. *Clin Infect Dis*. 2011 Mar 1;52(5):e121-6.

Lanciotti RS, Kosoy OL, Laven JJ, Panella AJ, Velez JO, Lambert AJ, et al. Chikungunya virus in US travelers returning from India, 2006. *Emerg Infect Dis*. 2007 May;13(5):764–7.

Leparc-Goffart I, Nougairede A, Cassadou S, Prat C, de Lamballerie X. Chikungunya in the Americas. *Lancet*. 2014 Feb 8;383(9916):514.

Moro ML, Gagliotti C, Silvi G, Angelini R, Sambri V, Rezza G, et al. Chikungunya virus in northeastern Italy: a seroprevalence survey. *Am J Trop Med Hyg*. 2010 Mar;82(3):508–11.

Powers AM, Logue CH. Changing patterns of chikungunya virus: re-emergence of a zoonotic arbovirus. *J Gen Virol*. 2007 Sep;88(Pt 9):2363–77.

Queyriaux B, Simon F, Grandadam M, Michel R, Tolou H, Boutin JP. Clinical burden of chikungunya virus infection. *Lancet Infect Dis*. 2008 Jan;8(1):2–3.

Rajapakse S, Rodrigo C, Rajapakse A. Atypical manifestations of chikungunya infection. *Trans R Soc Trop Med Hyg*. 2010 Feb;104(2):89–96.

Renault P, Solet JL, Sissoko D, Balleydier E, Larrieu S, Filleul L, et al. A major epidemic of chikungunya virus infection on Reunion Island, France, 2005–2006. *Am J Trop Med Hyg*. 2007 Oct;77(4):727–31.

Staples JE, Breiman RF, Powers AM. Chikungunya fever: an epidemiological review of a re-emerging infectious disease. *Clin Infect Dis*. 2009 Sep 15;49(6):942-8. doi: 10.1086/605496. Review.

Thiberville SD, Moyen N, Dupuis-Maguiraga L, Antoine N, Gould EA, Roques P, de Lamballerie X. Chikungunya fever: Epidemiology, clinical syndrome, pathogenesis and therapy. *Antiviral Res*. 2013;99:345–70.

Weaver SC, Osorio JE, Livengood JA, Chen R, Stinchcomb DT. Chikungunya virus and prospects for a vaccine. *Expert Rev Vaccines*. 2012 Sep;11(9):1087-101. doi: 10.1586/erv.12.84. Review. World Health Organization. Outbreak and spread of chikungunya. *Wkly Epidemiol Rec*. 2007 Nov 23;82(47):409–15.

References

CDC and Pan American Health Organization. Preparedness and response for chikungunya virus introduction in the Americas. Washington, DC: Pan American Health Organization, World Health Organization; 2011.

Economopoulou A, et al. Atypical Chikungunya virus infections: clinical manifestations, mortality and risk factors for severe disease during the 2005-2006 outbreak on Reunion. Epidemiol Infect 2009;137:534–41.

Gerardin P, et al. Multidisciplinary prospective study of mother-to-child chikungunya virus infection on the Island of La Reunion. PLoS Med 2008;5(3):e60.

Rajapaksa S, et al. Atypical manifestations of chikungunya infection. Trans Royal Soc Trop Med Hyg 2010;104:89-96.

Tandale BV, et al. Systemic involvements and fatalities during chikungunya epidemic in India, 2006. J Clin Virol 2009;46:145–149.

Access this Article in Online	
Quick Response Code	Website: www.darshanpublishers.com
	Subject: Virology

How to cite this article:
Ashikujaman Syed. (2018). Chikungunya Virus: An Infectious Disease. Int. J. Curr. Res. Biol. Med. 3(10): 20-30.
DOI: http://dx.doi.org/10.22192/ijcrbm.2018.03.10.003