





دانشگاه علوم پزشکی و خدمات بهداشتی درمانی گیلان



# بازآموزی بیماریهای منتقله از راه پشه آئدس

دکتر آبتین حیدرزاده  
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# Dengue virus infection Epidemiology

# INTRODUCTION

- Records of dengue-like illness date back more than 200 years and the viral etiology of dengue virus (DENV) was established in the 1940s
- Major changes in the epidemiology of dengue virus infections began after World War II, and geographic expansion of transmission has continued to date
- estimates of 390 million infections worldwide each year and over 2.5 billion individuals at risk for infection

# Key facts

- Dengue is a viral infection caused by the dengue virus (DENV), transmitted to humans through the bite of infected mosquitoes.
- About half of the world's population is now at risk of dengue with an estimated 100–400 million infections occurring each year.
- Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas.
- While many DENV infections are asymptomatic or produce only mild illness, DENV can occasionally cause more severe cases, and even death.
- Prevention and control of dengue depend on vector control. There is no specific treatment for dengue/severe dengue, and early detection and access to proper medical care greatly lower fatality rates of severe dengue.

# Risk factors

**VERY IMPORTANT**

- Previous infection with DENV increases the risk of the individual developing severe dengue.
- Urbanization (especially unplanned), is associated with dengue transmission through multiple social and environmental factors:
  - population density
  - human mobility
  - access to reliable water source
  - water storage practice etc.
- Community's risks to dengue also depend on population's knowledge, attitude and practice towards dengue, as well as the implementation of routine sustainable vector control activities in the community.
- Consequently, disease risks may change and shift with climate change in tropical and subtropical areas, and vectors might adapt to new environment and climate.

# Dengue is a Global Issue

- With 40% of the world's population living in areas at risk for transmission, dengue virus infection is a leading cause of illness in the tropics and subtropics.
- Although dengue rarely occurs in the continental United States, it is endemic in most US Territories such as Puerto Rico and the US Virgin Islands. Dengue is endemic in essentially all tropical and subtropical tourist destinations, worldwide (see map at right). The public health problem is that dengue incidence is increasing worldwide, and the severity of disease appears to be worsening.
- 
- Dengue is a reportable condition in the United States as of 2010. All confirmed and presumptive cases of dengue should be reported to local and state health departments.

# CLASSIFICATION

- Dengue viruses are members of the family Flaviviridae, genus *Flavivirus*
- Both epidemic and endemic transmission of the DENVs are maintained through a human-mosquito-human cycle involving mosquitoes of the genus *Aedes*

# MOSQUITO VECTORS

- *Aedes (Stegomyia) aegypti* mosquitoes
- *Ae. albopictus* mosquitoes are also a competent vector for the transmission of the DENVs under both experimental and natural conditions



# OTHER ROUTES OF TRANSMISSION

- **Nosocomial transmission**

- needle stick injury
- mucocutaneous exposure
- Blood transfusion

- **Vertical transmission**

- Delivery
- Breastfeeding
- Sexual transmission

# DISTRIBUTION OF AE. AEGYPTI MOSQUITOES



## Dengue, countries or areas at risk, 2008\*



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization  
Map Production: Public Health Information  
and Geographic Information Systems (GIS)  
World Health Organization



World Health  
Organization

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# DISTRIBUTION OF Dengue fever 2022



# PATTERNS OF TRANSMISSION

- Epidemic dengue
- Hyper endemic dengue

# FACTORS INFLUENCING TRANSMISSION

- population growth
- poor urban planning with overcrowding and poor sanitation
- modern transportation
  - Increased movement of mosquito vectors
- global climate change
  - (El Niño/Southern Oscillation events )
  - Increased vector density
  - Shorter mosquito incubation
  - increase the length of time that a mosquito remains infective

# Dengue Epidemiology in Endemic Countries

## Basic Principles

Primary disease presentation is as an acute febrile illness which makes dengue under recognized and underreported.

- Disease occurs year-round with a seasonal increase in incidence during the rainy season.
- Moderate to high annual incidence is detected with cyclical epidemics occurring every 3–5 years.
- Peak age of incidence varies by region but dengue is not just a disease of children.
- Risk of dengue occurs wherever the mosquito vector exists and includes urban and rural areas.
- Multiple circulating DENV types are present in most endemic areas.

# Asia and Pacific

- **Southeast Asia**

- southern China
- south of the island of Taiwan
- Thailand, Vietnam, and Indonesia
- Malaysia
- Philippines
- Japan

- **South Asia**

- India, Pakistan, and Sri Lanka

- **Western Pacific islands**

- American Samoa, Cook Islands, French Polynesia, New Caledonia, and Tonga

- **Australia**

- north Queensland

# Africa and Eastern Mediterranean

- sub-Saharan Africa
- Central Africa, East Africa, and the Middle East

# In Iran

Virologica Sinica. VS-2021-4709

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## LETTER

## Epidemiological Evidence of Mosquito-Borne Viruses among Persons and Vectors in Iran: A Study from North to South

Short title: Seroprevalence of DENV, WNV and CHIKV in Iran

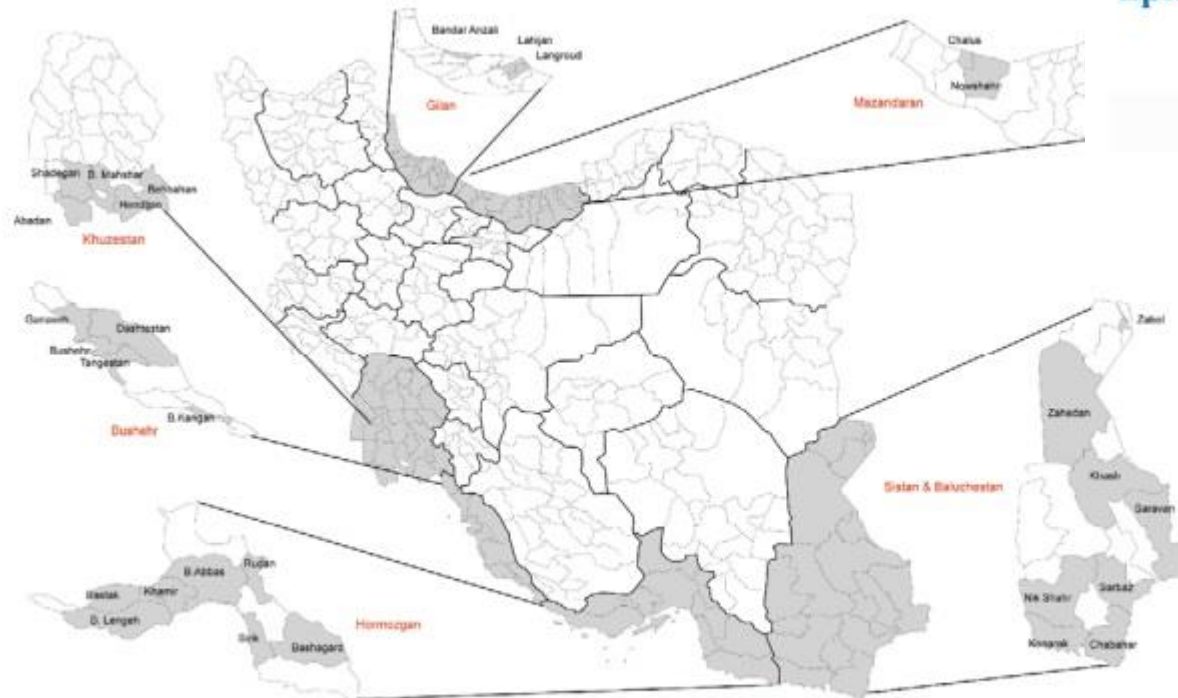


Figure 1. The map of the sampling regions in this cross-sectional study. The sampling areas are highlighted in grey.

Characteristic	Negative cases (N)	Positive cases (N)	Seropositivity (%)	OR	95%CI		Adjusted <i>P</i> -value
<b>Dengue virus</b>							
<b>Age (years)</b>							
1–24	194	9	4.4	Ref			
25–34	385	14	3.5	0.63	0.26	1.5	0.3
35–44	243	20	7.6	1.15	0.49	2.7	0.73
45–54	177	10	5.3	0.65	0.24	1.7	0.4
≥ 55	184	21	10.2	2.19	0.92	5.19	0.07
<b>Gender</b>							
Female	700	34	4.6	Ref			
Male	435	38	8.0	1.17	0.67	2.03	0.56
<b>Residential area</b>							
Bushehr	388	26	6.3	Ref			
Hormozgan	152	1	0.7	0.12	0.18	0.95	0.04
Sistan & Baluchestan	220	10	4.3	0.71	0.32	1.55	0.4
Gilan	154	11	6.7	0.77	0.32	1.8	0.54
Mazandaran	90	5	5.3	0.91	0.31	2.45	0.84
Khuzestan	179	21	10.5	1.9	0.95	3.7	0.057

# Europe

- southern France and Croatia
- Madeira Island (Portugal)
- Spain
- northeast Italy

# Americas

- **North America**

- Mexico
- southern United States

- **Central America**

- Nicaragua and Honduras

- **Caribbean**

- Dominican Republic
- Jamaica
- Guadeloupe
- Cuba
- Martinique

- **South America**

- Brazil and Venezuela
- Colombia

# Zika virus infection Epidemiology

# INTRODUCTION

- Zika virus is an :

arthropod-borne flavivirus transmitted by mosquitoes

- Zika virus is named after the Ugandan forest where it was first isolated from a rhesus monkey in 1947
- The first human cases were detected in 1952 in Uganda and Tanzania.

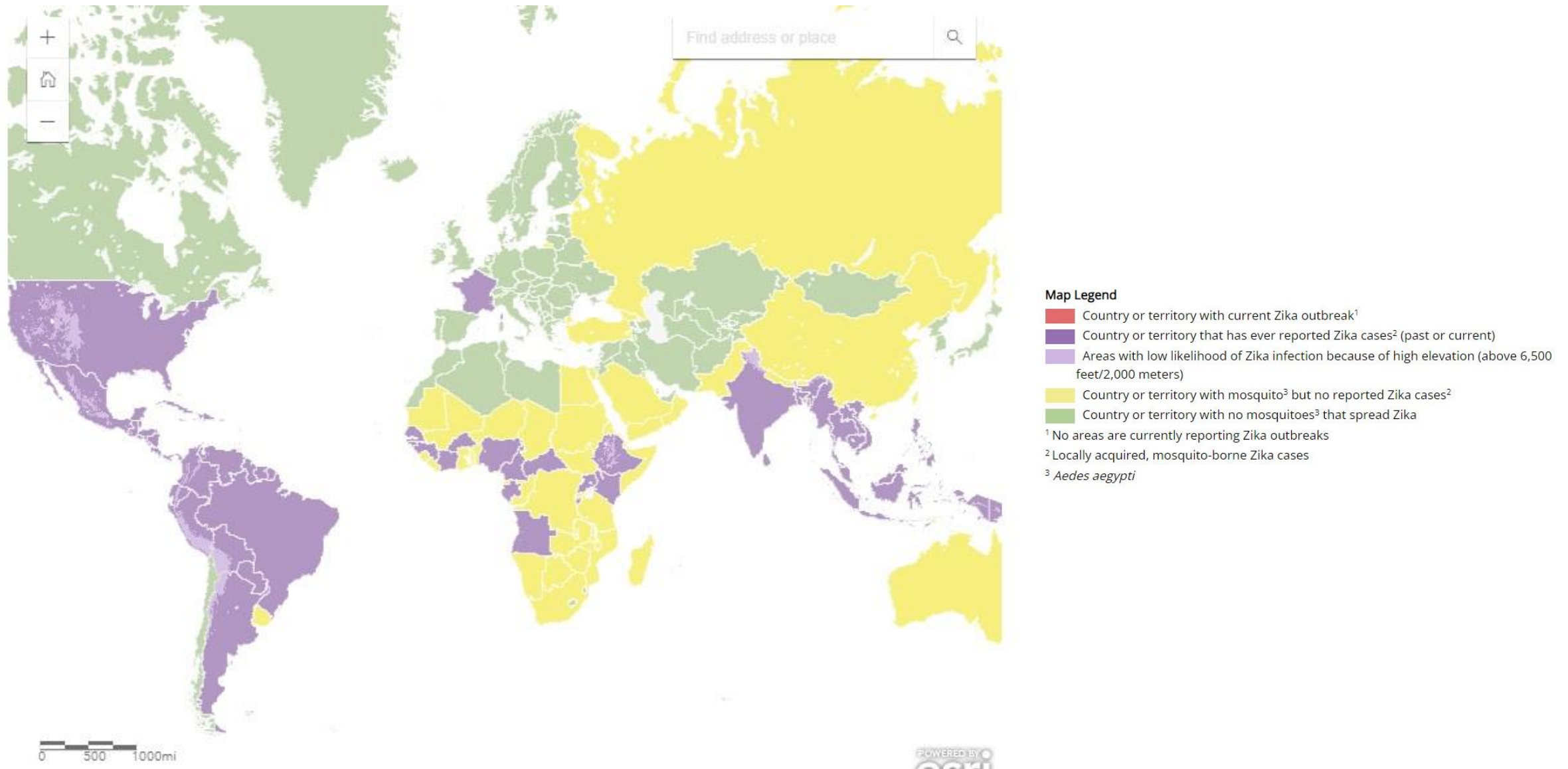
# Key facts

- **Zika virus is transmitted primarily by Aedes mosquitoes, which bite mostly during the day.**
- **Most people with Zika virus infection do not develop symptoms; those who do typically have symptoms including rash, fever, conjunctivitis, muscle and joint pain, malaise and headache that last for 2–7 days.**
- **Zika virus infection during pregnancy can cause infants to be born with microcephaly and other congenital malformations as well as preterm birth and miscarriage.**
- **Zika virus infection is associated with Guillain-Barré syndrome, neuropathy and myelitis in adults and children.**
- **In February 2016, WHO declared Zika-related microcephaly a Public Health Emergency of International Concern (PHEIC), and the causal link between the Zika virus and congenital malformations was confirmed. WHO declared the end of the PHEIC in November of the same year.**
- **Although cases of Zika virus disease declined from 2017 onwards globally, transmission persists at low levels in several countries in the Americas and other endemic regions.**

# Geographic distribution

- Outbreaks of Zika virus infection have occurred in :
  - Africa
  - Southeast Asia
  - The Pacific Islands
  - The Americas
  - The Caribbean.

# 2021 map of ZIKA



# Transmission

- Zika virus is carried by the :
  - *Aedes aegypti*
  - *Aedes albopictus*
- Zika virus may be transmitted to humans via the following
  - Bite of an infected mosquito
  - Maternal-fetal transmission
  - Sex
  - Blood product transfusion
  - Organ transplantation
  - Laboratory exposure
- Zika virus RNA has been detected in blood, urine, semen, saliva, female genital tract secretions, cerebrospinal fluid, amniotic fluid, and breast milk

# Chikungunya fever: Epidemiology

# INTRODUCTION

- Chikungunya virus is an arthropod-borne alphavirus transmitted by mosquitoes

# Key facts

- Chikungunya is a disease transmitted to humans by mosquitoes in Africa, Asia, and the Americas; sporadic outbreaks have been reported in other regions.
- Dengue and Zika have similar symptoms to chikungunya, making chikungunya easy to misdiagnose.
- Chikungunya causes fever and severe joint pain, which is often debilitating and varies in duration; other symptoms include joint swelling, muscle pain, headache, nausea, fatigue and rash.
- There is currently no approved vaccine or specific treatment for chikungunya virus infections.
- Due to the challenges in reporting and diagnosis, the number of people affected by chikungunya is underestimated.
- Severe symptoms and deaths from chikungunya are rare and usually related to other coexisting health problems.

# Geographic distribution

- Chikungunya virus is endemic in parts of West Africa; human serosurveys have identified antibodies to chikungunya virus in 35 to 50 percent of the population in some areas
- Outbreaks in Africa, Asia, Europe, islands in the Indian and Pacific Oceans, and subsequently in the Americas
- Chikungunya can cause large outbreaks with high attack rates, affecting one-third to three-quarters of the population in areas where the virus is circulating

# Transmission

- Mosquito bites
  - *Ae. aegypti*
  - *Ae. albopictus*
- Rarely via maternal-fetal transmission
- Rarely via blood products

# In Iran

*Virologica Sinica*. VS-2021-4709

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## **LETTER**

### **Epidemiological Evidence of Mosquito-Borne Viruses among Persons and Vectors in Iran: A Study from North to South**

**Short title: Seroprevalence of DENV, WNV and CHIKV in Iran**

Characteristic	Negative cases (N)	Positive cases (N)	Seropositivity (%)	OR	95%CI		Adjusted <i>P</i> -value
<b>Chikungunya virus</b>							
<b>Age (years)</b>							
1–24	202	1	0.5	Ref			
25–34	388	11	3.0	5.4	0.68	43.2	0.1
35–44	261	2	0.8	2.07	0.18	23.7	0.55
45–54	183	4	2.1	5.7	0.54	60.3	0.14
≥ 55	201	4	2.0	4.9	0.44	53.7	0.18
<b>Gender</b>							
Female	720	14	1.9	Ref			
Male	466	7	1.5	1.05	0.37	3.02	0.91
<b>Residential area</b>							
Bushehr	411	3	0.7	Ref			
Hormozgan	144	9	5.9	9.0	2.21	36.6	0.001
Sistan & Baluchestan	228	2	0.9	1.3	0.21	8.15	0.77
Gilan	160	5	3.0	4.2	0.8	22.86	0.08
Mazandaran	94	1	1.1	1.4	0.14	13.89	0.74
Khuzestan	198	2	1.0	1.25	0.19	8.1	0.8

# Seroepidemiology of dengue and chikungunya fever in patients with rash and fever in Iran, 2017

Forough Tavakoli<sup>1</sup>, Farhad Rezaei<sup>1</sup>, Nazanin Zahra Shafiei-Jandaghi<sup>1</sup>,  
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## Abstract

After the mass campaign of Measles and Rubella vaccination in 2003 in Iran, the cases of measles and rubella infection decreased but still, the cases of rash and fever were reported. It is worth noting that some other viral infections show signs similar to measles and rubella such as some arboviruses. Considering the epidemic outbreak of arbovirus infections in countries neighbouring Iran, we performed this study to estimate the possibility of chikungunya and dengue fever among measles and rubella IgM negative patients presenting with rash and fever from December 2016 to November 2017 in the National Measles Laboratory at Tehran University of Medical Sciences. Serum samples were selected at random from patients from eight provinces. The presence of DENV IgM and CHIKV IgM was examined by enzyme-linked immunosorbent assay. Of the 1306 sera tested, 210 were CHIKV seropositive and 82 were dengue seropositive. Statistical analysis demonstrated a significant increase in the CHIKV IgM antibody seropositivity rate in Kerman (OR = 2.07, 95% CI: 1.10–3.92;  $P = 0.024$ ) and Fars (OR = 1.77, 95% CI: 1.06–2.93;  $P = 0.027$ ). The DENV and CHIKV seropositivity rate in summer is higher than in other seasons ( $P < 0.01$ ). Our seropositive samples suggest possible CHIKV and DENV infection in Iran. It is likely that these viruses are circulating in Iran and there is a need to study vector carriage of these two viruses.

RESEARCH ARTICLE

# Dengue in the Middle East and North Africa: A Systematic Review

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Country, Ref.	Year(s) of study*	City or governorate	Setting; population (age range, years)	Sampling	Assay type	Assay make <sup>†</sup>	Target Protein	Assay serotype	Sample size	Prevalence	Additional testing & Comments
Iran (n = 4)											
Saidi [51]	1970	Multiple	n/s	n/s	HI	In-house	wv	1,2,3	394	6.0%**	possible cross-reaction to WNV
Saidi [52]	1970–71	Caspian region	Community; children (1–6)	Conv.	HI	In-house	wv	2	100	0%	
Chinikar [53]	2000–12	Countrywide	Clinical setting; AFI patients	Conv.	ELISA	Viracell	wv	1,2	300	3.3%	3.3% (10/300) were IgM+; DEN-1,2 were positive by PCR
Aghaie [14]	2014	Sistan-Baluchestan	blood donor center; general pop.	Conv.	ELISA	PanBio	Env	1–4	540	7.6%	78% (32/41) ELISA+ were IFA+

# Yellow fever: Epidemiology

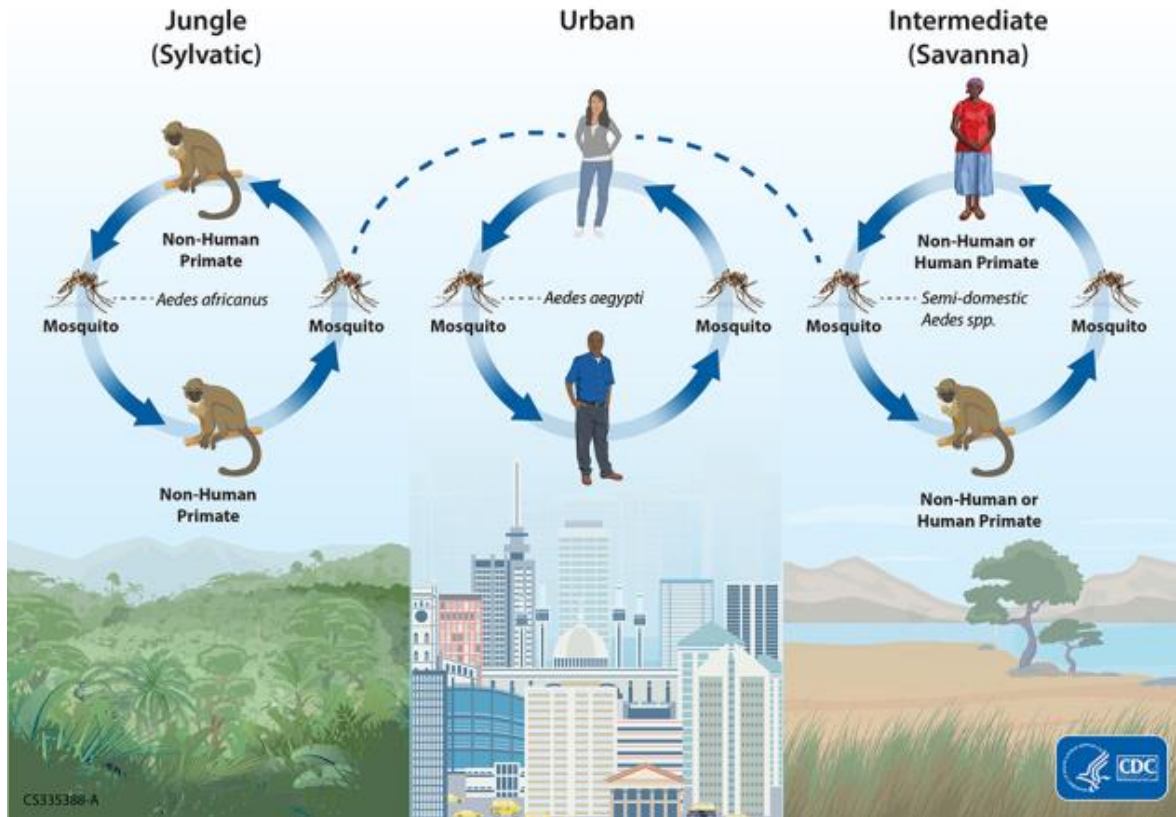
# Key facts

- **Yellow fever is an infectious disease transmitted by mosquitoes that bite mostly during the day.**
- **As of 2023, 34 countries in Africa and 13 countries in Central and South America are either endemic for, or have regions that are endemic for, yellow fever.**
- **Yellow fever is prevented by a vaccine, which is safe and affordable. A single dose of yellow fever vaccine is sufficient to grant life-long protection.**
- **A modelling study based on African data sources estimated the burden of yellow fever during 2013 was 84 000–170 000 severe cases and 29 000–60 000 deaths (1).**

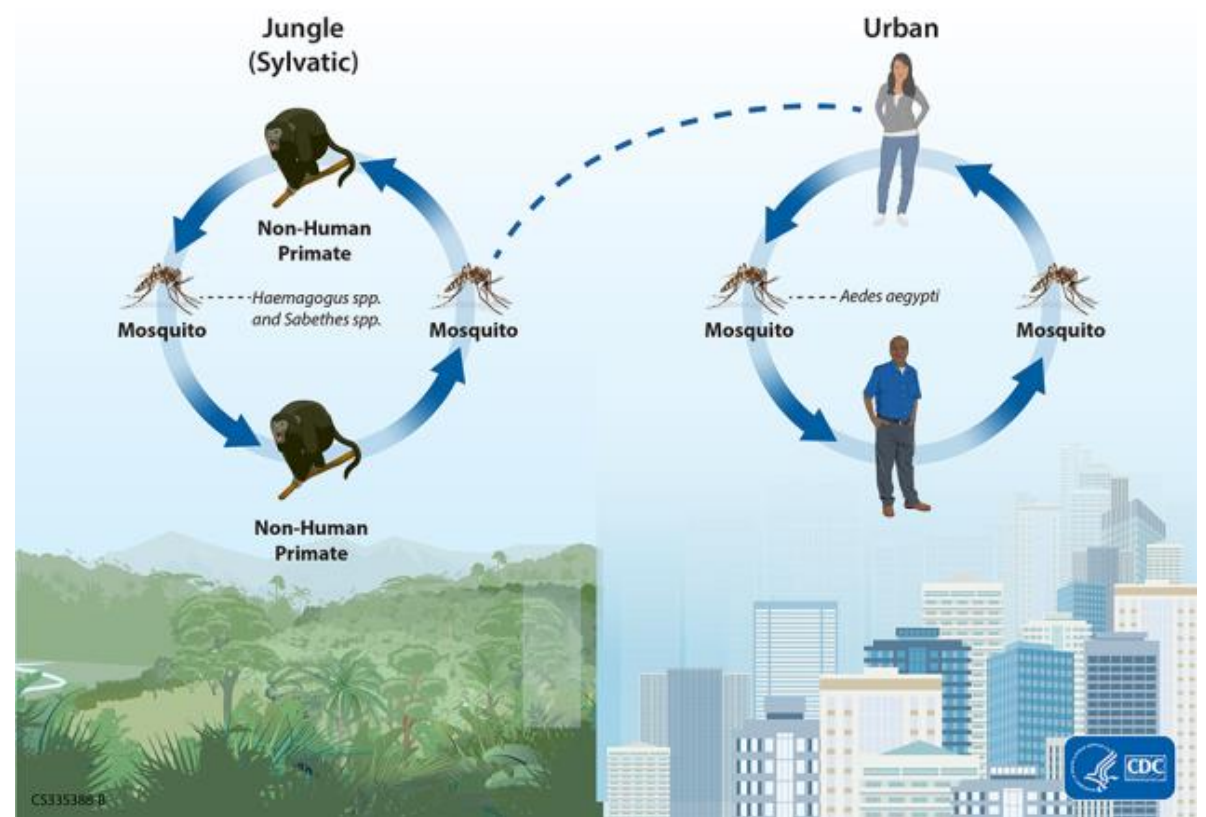
# Transmission of Yellow Fever Virus

Yellow fever virus has three transmission cycles: jungle (sylvatic), intermediate (savannah), and urban.

Yellow Fever Transmission Cycle—Africa



Yellow Fever Transmission Cycle—South America



# INTRODUCTION

- Yellow fever is a mosquito-borne viral hemorrhagic fever with a high case-fatality rate
- 1 percent of individuals with severe hepatitis in endemic areas of Africa may be caused by yellow fever
- there were 130,000 cases with viscerotropic disease and 78,000 deaths in Africa in 2013

# Geographic distribution

- tropical regions of sub-Saharan Africa and South America
- Angola
- Democratic Republic of the Congo
- South/central Africa
- West Africa
- Fewer cases occur in South America than in Africa

# Transmission

*Aedes aegypti* and *Aedes simpsoni*

با تشکر از توجه شما