Overview of chikungunya epidemiology

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Key features of transmission

• Chikungunya has been identified in over 60 countries in Asia, Africa, Europe and the Americas.

• Transmission mostly by *Aedes aegypti* and *Aedes albopictus*

• Other mosquitoes in Africa can act as efficient vectors for chikungunya: *Aedes dalzieli, Aedes furcifer, Aedes taylori, Aedes africanus, and Aedes luteocephalus*.

• Incubation period: 4-7 days (2-12 days).

• Infectious period humans: 7 days

• Extrinsic latent period: mean of 7 days (2 -9 days).

• Life expectancy of the mosquitos: 30 days.
Serial interval CHIKV

- Mosquito feeds/acquires virus
- Mosquito refeeds/transmits virus

Viremia
- Up to 7 d
- Extrinsic LP 7 days
- Intrinsic IP 3-5 days (3-12 days)

Illness
- IP: 4-7 days
- Human #1

Viremia
- Human #2

22% asymptomatic infection
Factors associated with CHIKV transmission

• Environmental/ecological conditions
• Abundance of mosquito egg laying habitats
• Completely naïve populations
• Alternate vector(s), new ecological niches involved
• Viral genetics / mutations
• Attack rates may be explained by:
  • Surveillance practices
  • Season of CHIKV introduction into a country or a region
  • Vector density and activity;
  • Vector control measures; and lifestyle differences
### Key features of transmission

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Asia and La Reunion</th>
<th>Americas</th>
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</thead>
<tbody>
<tr>
<td>$R_0$</td>
<td>3.0-4.2</td>
<td>2-4</td>
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<tr>
<td>Attack Rate %</td>
<td>16.55 – 55.6 %</td>
<td>41%</td>
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<tr>
<td>% Asymptomatic infections</td>
<td>3-22%</td>
<td>10-58.3%</td>
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<tr>
<td>Overall seroprevalence</td>
<td>38.2 – 75%</td>
<td>13-90%</td>
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<td>CFR</td>
<td>&lt;1%</td>
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<tr>
<td>At risk groups</td>
<td>Newborns, &gt;55 and comorbidities</td>
<td>&gt;45 and comorbidities</td>
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<tr>
<td>Persisting CHIKV disease</td>
<td>48.7%</td>
<td>45%</td>
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</tbody>
</table>
Re-emergence of Chikungunya 2004-2015
1,469,912 reported cases up to December 2016.

Incidence rates: 999.13 per 1,000 inhabitants.

Arbovirus transmission Colombia
Arbovirus transmission Brazil

Confirmed cases - DENV, CHKV, ZIKV in Brazil

- DENV cases
- CHKV cases
- ZIKV cases

Graph shows the confirmed cases of DENV, CHKV, and ZIKV in Brazil from 2000 to 2018.
CHIKV outbreaks and current transmission

Countries with current CHIKV transmission in LA

2017: France and Italy

2018: Kenya and Sudan


http://www.who.int/emergencies/diseases/chikungunya/en/
Seroprevalence studies in the Americas

- Nicaragua
  - Managua: 13.1% (Kuan et al., 2016)
- Brazil
  - Salvador: 57.1% (Dias JP et al., 2018)
  - Mato Grosso: 20% (Cunha RV et al., 2017)
- Grenada: 86% (Macpherson et al., 2016)
- Saint Martin: 17% (Gay et al., 2016)
La Reunion: 40% (Gerardin et al., 2008)
Bangladesh: 80% (Khatun et al., 2015)
India: 48% (Kawle et al., 2017)
Singapore: 1.9% (Ang LW et al., 2017)
Benin: 36.1% (Sambri et al., 2015)
Mozambique: 26.4% (Gudo et al., 2015)
Western Cameroon: 51% (Demanou et al., 2010)
Mayotte: 37.2% (Sissoko, 2008)
Grande Comore Island: 63% (Sergon et al., 2007)
La Reunion: 40% (Gerardin P. et al., 2008)

French Polynesia, 2014–2015: 76%
Conclusions

• Chikungunya virus has endemic transmission in some countries in Latin America and Southeast Asia.

• CHIKV transmission is heterogenous between and within countries and regions.

• More seroprevalence studies for CHIKV are needed to understand better the impact of previous outbreaks and endemic circulation.

• The estimated $R_0$ of CHIKV is from 2-4: attack rates 16-55%.

• The real burden of CHIKV is unknown.