**Literature on Arbovirus in Africa**

Salifou Bangoura et al. 2023, arboviruses represent a major cause of illness in Africa and have the potential to trigger widespread epidemics. Presented data on arbovirus epidemics in Africa in 2023. Data was collected on the WHO weekly bulletin on outbreaks and other emergencies, Africa CDC and prevention weekly event-based surveillance report. In 2023, 7 arboviruses were responsible for 29 outbreaks across 25 countries in Africa. The outbreak resulted in 19,569 confirmed cases and 820 deaths.

Leo Braack et al. 2018, Africa has been the source of most of the major mosquito-borne viruses of medical importance that currently constitute serious global public health threats. Increased human population growth ahead, coupled with increased international travel and trade is likely to sustain and increase the threat for further geographical spread of current and new arboviral disease. Epidemics in recent years of Zika in south Africa and central America, yellow fever in Africa and Brazil serve as reminders of the dramatic way apparently quiescent or stable zoonoses can flare up or spread with serious international public health, social and economic consequences. These events are steadily increasing in frequency, involving pathogens which establish foothold in new geographical territories where they become endemic after initial rapid spread. A disproportionately high percentage of the mosquito-borne arboviruses currently having a serious public impact at global health is of African origin. Mosquito-borne viruses affecting humans are concentrated in three families, the Flaviviridae genus flavivirus, Togaviridae genus alphavirus and Bunyaviridae primarily orthobunyavirus and Phlebovirus.

Grace m power conducted a systematic review to measure the association between socioeconomic position and infection due to arboviruses with mosquito vectors. Their study showed that lower education, income poverty, low healthcare coverage, poor housing materials, interrupted water supply, marital status, non-white ethnicities and migration status were linked to higher risks of arbovirus infections.

Salifou et al. dengue is the most prevalent arbovirus; 7.6 million cases had been reported to the WHO as of April 30, 2024, including 3.4 million confirmed cases and 3000 deaths. WHO report on 30 May 2024 Dengue-Global situation show that 90 countries have know active dengue transmission in 2024, not all of which have been captured in formal reporting. Many endemic countries do not have a strong detection and reporting mechanism, so the true burden of dengue globally is underestimated i.e. unrecognized disease spread. A report further reveals that there is a considerable overlap in the geographic distribution of dengue, chikungunya and zika viruses which are all transmitted by aedes mosquitoes and share some clinical features that can result in misdiagnoses and misreporting in the absence of differential laboratory testing. Surveillance data during large outbreaks of suspected dengue may erroneously include cases of one or both other diseases. A study in Brazil (Ribas Freitas AR et al 2024 in the state of minas Gerais in 2023 suspected dengue accounted for 84.4% of cases of the 828654 cases of suspected arboviruses and chikungunya accounted for 15.6%. the true proportion of the two diseases amongst lab confirmed cases was 65.9% chikungunya and only 34.1% dengue. Surveillance systems specifically targeting endemic transmission of chikungunya or zika are weak or non-existent in many countries. So far in 2024, more than 250000 cases of chikungunya have been reported to WHO and almost 7000 cases of zika virus disease. Africa region is strongly affected by arboviruses although the exact burden is not well understood due to challenges with lab capacity.

WHO report on dengue 2025

In 2024, in a 12-month period, 14.6 million cases and more than 12,000 reported dengue like deaths reported in over 100 countries. One modelling estimate indicates 390 million dengue virus infections per year of which 96 million cases manifest clinically. Another study estimates that 5.6 billion people are at risk of infection with dengue and other arboviruses. From Jan July 2025, over 4 million cases and 3000 deaths have been reported to WHO from 97 countries.

Samir Bhatt et al. 2013, dengue is a systemic viral infection transmitted between humans by aedes mosquitoes. To some, dengue is a life-threatening illness. The global distribution of the risk of dengue and its burden is poorly understood. They assembled all records of dengue occurrences and used modelling to map the global distribution of dengue risks. They paired the risk maps with longitudinal information from dengue cohort studies and population surfaces to infer the burden of dengue in 2010. They predicted that dengue is ubiquitous throughout tropics, with local spatial variations influenced by rainfall, temperature and the degree of urbanization. They used cartographic approaches to estimate that there are 390million dengue infections per year, of which 96millions are apparent.

Cameron P. Simons et al 2012 Dengue is a self-limited, systemic viral infection transmitted to humans by mosquitoes. Central to the emergence of dengue as a public health problem has been the dispersal of efficient mosquito vectors across much of the tropical and subtropical world. The disease emerged in Africa during the slave trade in 15th through 19th centuries, spread into Asia through commercial exchanges in the 18th and 19th centuries and has spread globally with advent of increased travel and trade. Dengue in Africa remain largely unquantified and recent outbreaks suggest that substantial parts of the continent may be at risk for increasing dengue transmission. Global trade, increased travel, urban crowding and ineffective vector control strategies have supported a pandemic in the modern era. Dengue is caused by one of the four single-stranded positive sense RNA viruses also called serotypes of the genus flavivirus. The infectious virus and the virus encoded NS1 are present in blood during the acute phase

**Febrile phase**

Characterized by high temperature (≥38.5°C) accompanied by headache, vomiting, myalgia and joint pains and sometimes transient macular rash. Children have high fever but generally less symptomatic than adults. Mild hemorrhagic manifestations such as petechiae and bruising particularly at venipuncture sites-the puncture of a vein as part of a medical procedure, typically to withdraw a blood sample or for an intravenous injection; and a palpable liver. Laboratory findings include mild-to-moderate thrombocytopenia and leukopenia often with a moderate elevation of hepatic aminotransferase levels. This phase lasts for 3-7 days after which most patients recover without complication. Thrombocytopenia is low blood platelet count which help in blood clotting while leukopenia is a reduction in the number of white blood cells in the blood which are important in the functioning of the immune system.

**Critical phase**

A small proportion of patients especially children and young adults experience systemic vascular leak syndrome- a rare and potentially life-threatening disorder where plasms and protein leak out of the blood capillaries into surrounding tissues leading to sudden drop in blood pressure(hypotension), generalized swelling (edema) and thickened blood (hemoconcentration), a condition known as Clarkson disease. If the pulse pressure narrow to 20 mm Hg or less, accompanied by signs of peripheral vascular collapse, dengue shock syndrome is diagnosed and urgent, careful resuscitation is required. Hemorrhagic manifestations are most common. Significant bleeding occurs only rarely in children, usually associated with profound and shock. Skin and mucosal bleeding mainly occur in adult

**Recovery phase**

The altered vascular permeability is short lived, reverting spontaneously to a normal level after approximately 48-72hrs. A second rash may appear ranging from mild maculopapular rash to a severe itchy lesion suggesting leukocytoclastic vasculitis that resolves with desquamation over a period of 1-2 weeks.

Natasha Evelyn Anne Murray 2013: epidemiology of dengue: dengue is regarded as the most important mosquito-borne viral disease. A history of symptoms compatible with dengue can be traced back to the Chin Dynasty of 265-420 AD. The true of dengue globally is difficult to ascertain due to inadequate disease surveillance, misdiagnosis and low levels of reporting. Available data underestimates the true burden of dengue

Epidemiology of arboviruses in Africa

Alemu Gedefie et al 2025: arbovirus infections are a global public health threat, accounting for 73% of the total emerging and re-emerging human infections where the burden is worsened in sub-Saharan African. The surveillance system has been challenged, and their burden and magnitude are not well estimated due to underestimates of true arbovirus burdens by passive case detections. A systematic review and meta-analysis were conducted to assess the prevalence of arboviruses in human and livestock in Ethiopia. The findings showed that the overall seroepidemiology of arboviruses in human was 15.43(95% CI: 12.11-18.76) for IgG and 10.04% (95% CI: 6.46-13.62) for IgM while molecular prevalence was 38.42(95% CI: 21.77 – 55.08).

Massengo NRB et al. 2023, due to the explosion in population growth along with the geographical and climatic conditions (equatorial and or tropical climate), Africa is becoming a major hotspot for various socio-health issues associated with infectious diseases, including arboviruses. The impact of arbovirus disease in Africa is significant particularly in low resource settings where access to healthcare is limited. The burden of arboviral diseases on individuals and communities can be devastating, with significant economic and social costs. Some of the common arboviruses in Africa include dengue, yellow fever, zika, chikungunya, rift valley fever and Congo Crimean hemorrhagic fever.

Knowing the number of rvfv cases and likely locations with high infection rates can help policy makers and vaccine developers better estimate demand rvfv vaccines in future.

Literature Review on Seroprevalence of Arboviruses in Kenya

Jason M. Blaylock et al. 2011: Seroprevalence and Sero incidence of dengue virus infection in western Kenya. Epidemics of dengue fever has been documented throughout African continent; however, little is known about the prevalence or incidence of dengue virus in the absence of an outbreak. No study has analyzed the prevalence of dengue infection in western kenya. They described the seroincidence and seroprevalence of dengue infection in western kenya. Sera obtained from 354 healthy afebrile children ages 12-47 months from Kisumu district seroprevalence was 1.1%(4/354) and seroincidence of 8.5 seroconversions per 1000 persons per year. Continued investigation and evaluation using a different sample population is necessary to further confirm this finding

Justification of the geographical distribution and burden of arboviruses

It is essential for understanding the contribution to the morbidity and mortality burdens, in determining how to allocate optimally the limited resources available for control. Estimates of both clinical and subclinical infection distribution forms a key requirement for assessing clinical surveillance

Emily Mary Gainor et al 2022: they review important considerations for dengue disease in Africa including epidemiology and underestimation of the disease burden in African countries, issues with malaria misdiagnosis and co-infections. There findings show that dengue is prevalent in Africa and more widespread than reported data. Dengue misdiagnosis is a problem in Africa due to non-specific clinical presentation of dengue leading to misdiagnosis as malaria. Dengue in Africa has been documented since 1779 but there has been fragmented reporting of the epidemiology of the disease.

Carren Bosire: on dengue infection in Kenya, dengue cases occur frequently in Kenya, although the trend is not uniform across the country. Africa has reported 45 DENV outbreaks between 1960 – 2020 out of which 17 have occurred in east Africa. Kenya has experienced substantial DENV infections and outbreaks since 1982.

Dengue outbreaks in Kenya

Dengue outbreak of 1982 in Malindi and Kilifi

The first virologically epidemic caused by dengue type 2 occurred between march and October 1982 where seven strains of virus were identified. The antibody prevalence rate in outpatients attending hospital on the northern coast od Kenya was less than 8% in June to more than 50% by October 1982. No dramatic increase in morbidity or mortality was noted by medical staff working in the area. B.K Johnson et al 1982 epidemic dengue fever caused by dengue type 2 virus in Kenya.

Dengue outbreak of 2011 in Mandera

Dengue outbreak was confirmed in Somalia which borders Mandera town in over 100 African mission soldiers in Somalia (AMISOM) between May to October 2011 for DENV type 1,2 and 3. Further explanation: acute febrile illness with 3 deaths occurred, initial sample of 122 was sent to KEMRI for testing and 82% tested positive for dengue. Enhanced surveillance with 134 samples, 80% were positive for dengue virus. There was an upsurge of febrile patients who were negative for malaria on microscopy from September 2011, reported in several health facilities in Mandera town. Out of 11 blood samples collected, 6 tested positive for dengue virus 3. Mark obonyo et al, 2018 investigated suspected dengue outbreak in Mandera town between 26th Sep – 5th Oct 2011. Their investigation was based on a suspected case and 33 cases meeting the suspect definition of whom 30(91%) were positive for dengue virus serotype 3. Among 30 confirmed patients, 20(67%) required hospitalization (median hospitalization period, two days with a range 1-4 days). Additional comments: a global study on dengue prevalence estimates that approximately 3.9 billion people in 128 countries are at risk of infection with dengue virus.

Dengue outbreak of 2017 in Mombasa

A dengue outbreak occurred in Mombasa on May 7, 2017, where all sub counties were affected. A rapid diagnostic test kit confirmed 119 cases in all sub counties of Mombasa. Jacqueline Kyungah Lim et al 2020, conducted a passive health facility-based fever surveillance in Mombasa between March 2016 - May 2017 to estimate the proportion of dengue-positive cases among febrile patients. Among 482 enrollees. 295(61.2%) were positive of dengue. The surveillance covered the beginning of the outbreak in April-May 2017 during which 73.9% of the enrollees were dengue positive. Dengue fever is a mosquito-borne flavivirus infection caused by four related but antigenically distinct dengue viruses and is a major and rapidly increasing global public health problem.

WHO report on Chikungunya 2025

Between1 Jan – 30th September 2025, a total of 263 592 suspected and 181 679 confirmed chikungunya disease cases and 155 deaths were reported globally in 40 countries. Prior to 2025, current and previous autochthonous transmission of chikungunya has been reported in 119 countries and territories. Infection with one serotype confers long-lived serotype-specific immunity but only short-lived cross immunity between serotypes. Young age, female sex, high body mass index, virus strain and genetic variants of the human major-histocompatibility complex class I-related sequence B and phospholipase C epsilon 1 gene as risk factors for severe dengue. Secondary infection, in the form of two sequential infections by different serotypes is also a risk factor. After an incubation period of 3-7 days, symptoms start suddenly and follows three phases, initial febrile phase, a critical phase around the time of defervescence and spontaneous recovery period.

The variation in distribution of cases across regions highlights the importance of continued investment in surveillance, preparedness, and response capacities to address evolving regional dynamics. WHO continues to call on all countries to strengthen their healthcare and laboratory systems to enable rapid detection, timely reporting, and effective response to chikungunya outbreaks

De Roo et al. 2024: Global health and economic burden of Chikungunya

Chikungunya is a mosquito-borne arboviral disease posing an emerging global public health threat. Current estimates of the economic and health impact remain limited and potentially underestimated. The study revealed that a total of 18.7 million cases in 110 countries between 2011 -2020, causing 1.95 million DALYs. The total economic burden caused by chikungunya in 10 years was $2.8 billion in direct costs and $47.1 billion in indirect cost worldwide. Their arguments: the actual burden is likely underreported due to misdiagnosis, limited diagnostic infrastructure and issues of healthcare access.

Abdirasak sharif Ali Mude et al. 2024: the incidence of chikungunya in tropical Africa is still of major epidemiological significance. Lack of accurate reporting and misdiagnosis have hindered establishment of a dependable yearly global data on chikungunya cases. Most low-income nations where the illness are widespread, routine screening for chikungunya is lacking. While there have been some individual reports, the actual prevalence of the phenomenon at both national and regional levels is still uncertain. Chikungunya has emerged as a notable public health issue in east Africa in recent decades.