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& Family Welfare  
Government of India



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COUNTRY OFFICE FOR  
India

World Health Day 2014



**SMALL BITE:  
BIG THREAT**

Fact sheets on vector-borne diseases in India

Malaria • Dengue • Lymphatic filariasis • Kala-azar • Japanese encephalitis • Chikungunya

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## INTRODUCTION

Vectors are organisms that transmit pathogens and parasites from one infected person (or animal) to another, causing serious diseases in human populations. Every year there are more than one billion cases and over one million deaths from vector-borne diseases such as malaria, dengue, schistosomiasis, human African trypanosomiasis, leishmaniasis, Chagas disease, yellow fever, Japanese encephalitis and onchocerciasis, globally.

Vector-borne diseases account for over 17% of all infectious diseases.

Distribution of these diseases is determined by a complex dynamic of environmental and social factors. Globalization of travel and trade, unplanned urbanization and environmental challenges such as climate change are having a significant impact on disease transmission in recent years. Some diseases, such as dengue, chikungunya and West Nile virus, are emerging in countries where they were previously unknown. Changes in agricultural practices due to variation in temperature and rainfall can affect the transmission of vector-borne diseases. Climate information can be used to monitor and predict distribution and longer-term trends in malaria and other climate-sensitive diseases.

Important vector-borne disease for India, include malaria, dengue, Japanese encephalitis, kala-azar, lymphatic filariasis and chikungunya. They are being addressed by the National Vector Borne Disease Control Programme, Directorate of Health Services, Ministry of Health & Family Welfare, Government of India.

This information booklet contains technical fact sheets on the six major vector-borne diseases in India and has been jointly produced by the National Vector Borne Disease Control Programme and WHO Country Office for India.

# Malaria

## A complex public health problem

### Key facts

- Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected mosquitoes.
- In 2012, malaria caused an estimated 627 000 deaths globally (with an uncertainty range of 473 000 to 789 000), mostly among African children.
- Malaria is preventable and curable.
- Increased malaria prevention and control measures are dramatically reducing the malaria burden in many places, including India, although it remains a public health problem in 16 states.
- Non-immune travelers from malaria-free areas are very vulnerable to the disease when they get infected.

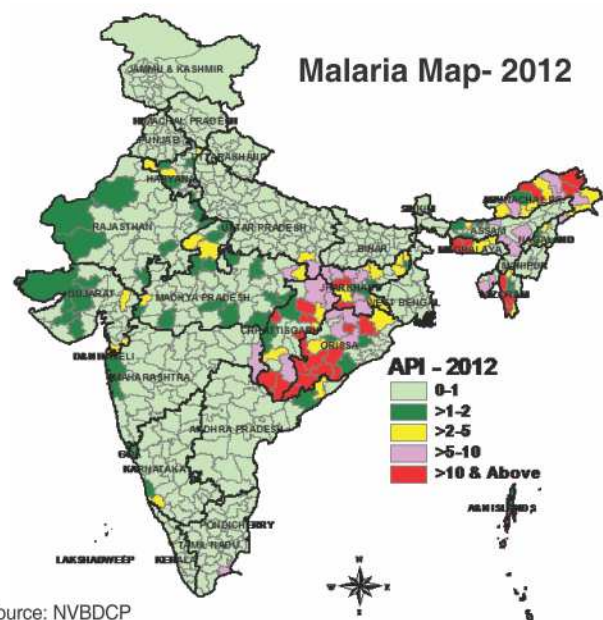
### Global burden

- According to the latest WHO estimates, released in December 2013, there were about 207 million cases of malaria in 2012 (with an uncertainty range of 135 million to 287 million) and an estimated 627 000 deaths (with an uncertainty range of 473 000 to 789 000). Malaria mortality rates have fallen by 45% globally since 2000 and by 49% in the WHO African Region.
- Most deaths occur among children living in Africa where a child dies every minute from malaria. Malaria mortality rates among children in Africa have been reduced by an estimated 54% since 2000.

### Burden in India

- Malaria is a public health problem in several parts of India. About 95% population in the country resides in malaria endemic areas and 80% of malaria reported in the country is confined to areas consisting 20% of population residing in tribal, hilly, difficult and inaccessible areas.
- WHO estimates that India accounts for three-quarter of all malaria cases in South-East Asia. As per World Malaria Report 2012, globally India is on eighteenth position in the total reported malaria cases and on twenty-first position in reported malaria deaths.
- High malaria burden states in India include seven North-eastern states and nine other states - Orissa, Jharkhand, Chhattisgarh, Madhya Pradesh, Andhra Pradesh, Maharashtra, Gujarat, Karnataka and West Bengal.

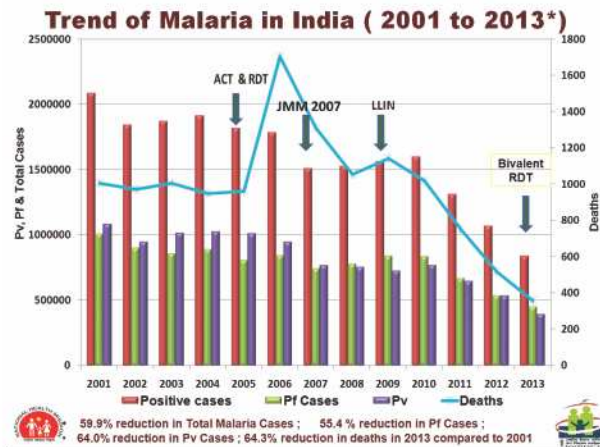
- In India, *P.falciparum* (Pf) and *P.vivax* are the most common species causing malaria. *P.vivax* is more prevalent in the plains while *P.falciparum* predominates in forested and peripheral areas. Malaria in India is mostly unstable and outbreaks occur frequently in various parts of the country, caused mostly by *P.falciparum* infections.
- The reported Pf cases declined from 1.14 million in 1995 to 0.53 million cases in 2012. However, the Pf percentage has gradually increased from 39% in 1995 to 50.01% in 2012.
- Maximum number of malaria deaths were reported from the states of Odisha, Mizoram, Meghalaya, Maharashtra, Assam, Tripura, Arunachal Pradesh, Nagaland, Gujarat, Jharkhand and Andhra Pradesh.



## Annual Parasite Incidence (API)

The number of districts with API > 10 has decreased from 59 in 2000 to 54 in 2010 and further to 36 in 2011 and 32 in 2012.

There has been a decline in number of deaths in year 2012 as compared to previous years.



Source: NVBDCP

## Risk factors for transmission

- Malaria is transmitted exclusively through the bites of *Anopheles* mosquitoes. The intensity of transmission depends on factors related to the parasite, the vector, the human host, and the environment.
- Increasing human activities, such as urbanization, industrialization and construction projects with consequent migration, deficient water and solid waste management, indiscriminate disposal of goods (tyres, containers, junk materials, cups, etc.) create mosquitogenic conditions and thus contribute to the spread of vector-borne diseases.
- Besides, hot and humid climate, dense forest and hilly areas inhabited by tribal population also contribute to malaria transmission.

## Specific population risk groups include:

- young children
- non-immune pregnant women
- people with HIV/AIDS
- international travelers from non endemic areas

## Clinical presentation

- Malaria is an acute febrile illness. In a non-immune individual, symptoms appear in seven days or more (usually 10-15 days) after the infective mosquito bite. The first symptoms—fever, headache, chills and vomiting—may be mild and difficult to recognize as malaria.
- If not treated within 24 hours, Pf malaria can progress to severe illness often leading to death. Children with severe malaria frequently develop one or more of the following symptoms: severe anemia, respiratory distress in relation to metabolic acidosis, or cerebral malaria. In adults, multi-organ involvement is also frequent.
- In malaria endemic areas, persons may develop partial immunity, allowing asymptomatic infections to occur.

## Treatment strategies

Early diagnosis and treatment of malaria reduces disease and prevents deaths. It also contributes to reducing malaria transmission. The best available treatment, particularly for *P.falciparum* malaria, is artemisinin-based combination therapy (ACT).

As per national programme strategy:

### 1. Pf malaria (uncomplicated)

- (a) North-eastern states: ACT-AL for three days and primaquine on day two.
- (b) In states other than North-eastern states: ACT-SP (co-administration on day one and Artemisinin for the next two days).

### 2. Pregnancy

- (a) First trimester: quinine salt 10mg/kg three times daily for seven days
- (b) Second and third trimester: area specific ACT

### 3. *P. vivax* malaria

Chloroquine plus primaquine for 14 days under supervision.

## Control of malaria

Vector control is the main way to reduce malaria transmission at the community level. It is the only intervention that can reduce malaria transmission from very high levels to close to zero. Indoor residual spraying (IRS) with insecticides is a powerful way to rapidly reduce malaria transmission. Its full potential is realized when at least 80% of houses in targeted areas are sprayed.

For individuals, personal protection against mosquito bites represents the first line of defense for malaria prevention.

## Programme strategies

- The National Vector Borne Disease Control Programme (NVBDCP) is the technical agency responsible for the prevention and control of all vector-borne diseases in India, including malaria.
- The national strategy on malaria control has undergone a paradigm shift with the introduction of new interventions for case management and vector control, namely rapid diagnostic tests, artemisinin based combination therapy and long lasting insecticidal nets (LLINs).
- Malaria surveillance is carried out through: active and passive surveillance in India. Active surveillance is performed by health workers by conducting house to house visits on fortnightly basis throughout the year. Passive surveillance is carried out by primary health centers, malaria clinics, CHCs and other secondary and tertiary level health institutions where patients visit for treatment.
- In addition, female village volunteers called ASHA (accredited social health activists) have been deployed in each village for a population of 1000 since the launch of the National Rural Health Mission, who have been trained to diagnose malaria using RDTs and accordingly provide treatment.
- Pf-specific rapid diagnostic test has been introduced in the programme from year 2005-06. It is used in the remote inaccessible areas by the village level community health volunteers and the field level multi-purpose health workers at the sub-centers in high malaria endemic districts. With the availability of thermo-stable Bivalent RDT, it has been introduced in the programme from 2012 onwards.

- LLINs have been introduced in the program for personal protection and to interrupt transmission. The scaling up of LLINs is on priority and about 20 million LLINs are expected to be procured and distributed in next five years.



Long lasting insecticidal nets (LLINs) help reduce malaria burden. WHO recommends coverage for all at-risk persons; and in most settings where malaria is a public health problem.

Source: NVBDCP

## WHO recommends

- Stronger malaria surveillance systems are urgently needed to enable a timely and effective malaria response in endemic regions, to prevent outbreaks and resurgence and track progress. WHO recommends that enabling mechanisms (trained human resources, health system strengthening efforts) be in place to administer the required interventions.
- Policy change from As-SP to appropriate quality assured ACT medicines in a phased manner.
- There are issues about underestimation of malaria burden in India making it difficult to implement effective control strategies. Furthermore, due to incomplete scope of detection, malaria parasite diversity and the distribution of malaria drug resistance on the Indian subcontinent may not be optimally characterized. More efforts need to be done for engagement of private sector by the national programme.
- States of Odisha, Chhattisgarh, Tripura, Meghalaya and Mizoram reported more than 70% of Pf cases, indicating that state specific strategies have to be evolved to interrupt malaria transmission.

- There are issues of quality assurance of the malaria microscopy at various levels in the system. Bivalent RDTs have proven and easy to learn to use; and should be the method of diagnosis where quality of microscopy cannot be sustained or results cannot be provided atleast on same day. Malaria microscopy, wherever available must be quality assured through QA/QC stringent procedures as per WHO guidelines.
- There is need for conducting feasibility studies for planning malaria elimination programme in subsequent years.

# Dengue

## Changing epidemiology

### Key facts

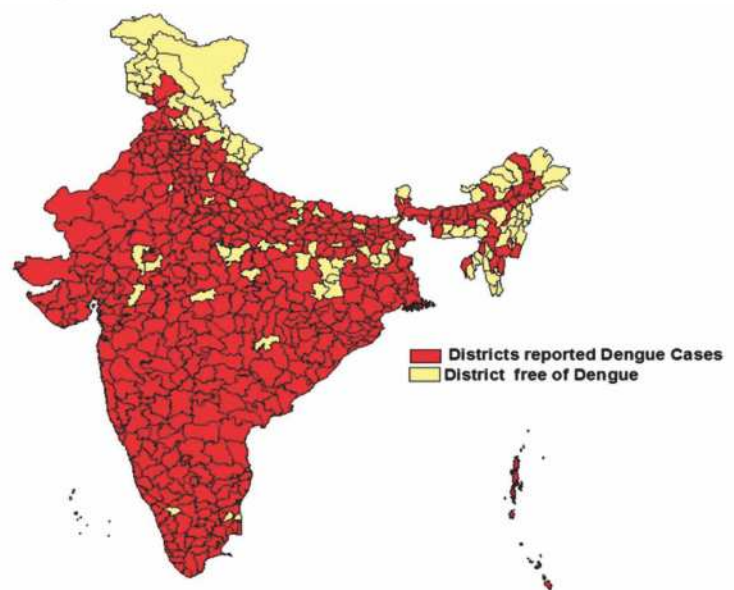
- Dengue is a mosquito-borne viral infection.
- The infection causes flu-like illness, and occasionally develops into a potentially lethal complication called dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS).
- The global incidence of dengue has grown dramatically in recent decades.
- About half of the world's population is now at risk.
- Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas.
- Severe dengue is a leading cause of serious illness and death among children in some Asian and Latin American countries.
- Dengue is endemic in India and outbreaks occur every year.
- There is no specific treatment for dengue/severe dengue, but early detection and access to proper medical care lowers fatality rates.
- Dengue prevention and control solely depends on effective vector control measures.

### Global burden

- Dengue is a mosquito-borne infection found in tropical and sub-tropical regions around the world. In recent years, transmission has increased predominantly in urban and semi-urban areas and has become a major international public health concern.
- Over 2.5 billion people—over 40% of the world's population—are now at risk from dengue, a mosquito borne infection. WHO currently estimates that there may be 50-100 million dengue infections worldwide every year.
- Before 1970, only nine countries had experienced severe dengue epidemics. The disease is now endemic in more than 100 countries in Africa, the Americas, the Eastern Mediterranean, South-east Asia and the Western Pacific.

- Not only is the number of cases increasing as the disease spreads to new areas, but outbreaks are also occurring. Recurring outbreaks of dengue have been reported from Andhra Pradesh, Delhi, Goa, Haryana, Gujarat, Karnataka, Kerala, Maharashtra, Rajasthan, Uttar Pradesh, Odisha, Pondicherry, Punjab, Tamil Nadu and West Bengal. Cases are reported from rural areas as well.

### Dengue affected areas since 1991



### Burden in India

- The disease is now endemic in the entire country. As per the national programme, 31 states reported 74 201 cases of dengue and 167 deaths in 2013.

Source: NVBDCP

## Risk factors and transmission

- The dengue viruses have four virus serotypes, which are designated as DEN-1, DEN-2, DEN-3 and DEN-4. While infection with any one serotype confers lifelong immunity to the virus serotype, all four are antigenically similar yet different enough to elicit cross-protection only for a few months. Subsequent infections by other serotypes increase the risk of developing severe dengue. All four dengue virus serotypes are isolated in India. At present DEN-1, DEN-2 and DEN-3 serotypes are widespread in India.
- Dengue is transmitted by the bite of female *Aedes* mosquito that becomes infected with dengue virus when blood meal from person during the acute febrile (viraemia) phase of dengue illness (five-six days). After an extrinsic incubation period of eight to ten days, the mosquito becomes infected and virus is transmitted when the infective mosquito bites man.
- In India, *Ae. aegypti* is the main vector in most urban areas; however, *Ae. albopictus* is also found as vector in few areas of southern and eastern India.
- The *Ae. aegypti* mosquito lives in urban habitats and breeds mostly in man-made containers. Unlike other mosquitoes, it is a daytime feeder; its peak biting periods are in the morning and in the evening before dusk.
- Female *Ae. aegypti* bites multiple people during each feeding period. Transovarian transmission (infection carried over to the next progeny of mosquitoes through eggs) and capacity of the eggs to remain viable for one year without water has made the control more complicated.



*Aedes aegypti* is a day biter and breeds mostly in man-made containers  
Source: WHO

## Clinical presentations

- Clinical manifestations vary from undifferentiated fever to florid hemorrhage and shock. The clinical presentations depend on age, immune status of the host and the virus strain.
- Dengue should be suspected when a high fever (40°C/104°F) is accompanied by two of the following symptoms: severe headache, pain behind the eyes, rash, muscle and joint pains, nausea and vomiting.
- Warning signs of severe dengue (DHF), a potentially deadly complication of dengue may occur in some cases three-seven days after the first symptoms in conjunction with a decrease in temperature (below 38°C/100°F). These include bleeding from internal organs, bleeding gums, severe abdominal pain, persistent vomiting, rapid breathing, fatigue, restlessness, blood in vomit etc. Due to increased vascular permeability blood pressure drops and patient goes to shock. The next 24-48 hours of the critical stage can be lethal; proper medical care is needed to avoid complications and risk of death.

## Treatment

- There is no specific treatment for dengue fever. Antipyretics and cold sponging may be used to lower the body temperature. Aspirin/NSAID like Ibuprofen etc. should be avoided since it may cause platelet dysfunction gastritis, vomiting and, acidosis. Paracetamol is preferable.
- For severe dengue, medical care by physicians and nurses experienced with the effects and progression of the disease can save lives—decreasing mortality rates. Maintenance of the patient's body fluid volume is critical to severe dengue care.

## Prevention and control

- There is no vaccine to protect against dengue. Developing a vaccine against dengue/severe dengue has been challenging although there has been recent progress in vaccine development.

- Dengue prevention and control solely depends on effective vector control measures, which include:
  - Preventing mosquitoes from accessing egg-laying habitats by environmental management and modification.
  - Disposing of solid waste properly and removing artificial and man-made habitats. Covering, emptying and cleaning of domestic water storage containers on a weekly basis.
  - Applying appropriate insecticides to large outdoor water storage containers that cannot be emptied.
  - Using of personal household protection such as
    - window screens, long-sleeved clothes, repellents
    - treated materials
  - Improving community participation and mobilization for sustained vector control.
  - Applying insecticides as space spraying during outbreaks is one of the emergency vector control measures.
- 7. Inter-sectoral coordination–Different ministries (Urban Development, Rural Development, Panchayati Raj Institutions, Surface Transport, Human Resource Development, Water and Sanitation)
- 8. Monitoring and supervision–Analysis of reports, review, field visit and feedback
- Diagnostic facilities (secondary and tertiary level hospitals) have been identified as sentinel laboratories under the programme (currently 394), which are linked to 14 Apex Referral Laboratories.
- ELISA based NS1 tests (antigen based) have been introduced, which can detect a case from the first day of disease in addition to existing Mac ELISA test (antibody based), which can detect a case only after fifth day of the disease.
- Under the NVBDCP, the case definitions as recommended by WHO are being followed. A national guideline is available for case management.
- The case fatality rate (deaths per 100 cases) due to dengue, which was 1.5 % in 2006 has declined to 0.2% in 2013.
- The National Institute of Virology, Pune has been identified as the nodal institute for manufacturing and directly supplying the Mac ELISA kits to the sentinel labs per programmatic requirements.
- Monitoring of vector population in vulnerable areas is being carried out. Medical officers are being trained for effective case management. Intensive social mobilization campaigns are being undertaken for behavior change communications and community participation in reducing breeding of mosquitoes.
- Outbreaks of dengue are also alerted and verified under the Integrated Disease Surveillance Project. State and district rapid teams have been sufficiently trained to effectively respond to events.

## National programme strategies

- The current strategic plan for dengue under the National Vector Borne Disease Control Programme (NVBDCP) has eight key elements, called as 'Octalogue'.
  1. Surveillance–Disease and entomological surveillance
  2. Case management–Lab diagnosis and clinical management
  3. Vector management–Environmental management for source reduction, chemical control, personal protection and legislation
  4. Outbreak response–Epidemic preparedness and media management
  5. Capacity building–Training, strengthening human resource and operational research
  6. Behavior Change Communication–Social mobilization and IEC

## WHO recommends

- In view of increasing endemicity, WHO in 2010 grouped India in Category A countries of its South-East Asia Region, where dengue is a major public health

problem, leading cause of hospitalization and death among children, hyperendemic in urban centres, spreading to rural areas and having multiple virus serotypes circulating.

- Intensified efforts are needed for surveillance programs, coupled with improvised disease diagnostics, effective anti-dengue treatment measures, and controlling the disease transmission by following an effective implementation of vector control programs.
- Effective intersectoral coordination is one of the major challenges for prevention and control of dengue, and calls for stewardship and health in all policies.
- More needs to be done for community mobilization for prevention and control of dengue. Operational research can guide risk communication and behavior change communication for dengue prevention.

WHO Global Strategy for Dengue Prevention & Control (2012-2020) has set the goal to reduce the burden of dengue with the following objectives:

- To reduce dengue mortality by atleast 50% by 2020;
- To reduce dengue morbidity by atleast 25% by 2020, and
- To estimate the true burden of the disease by 2015.

(Baseline 2010)



Source: NVBDCP



### Controlling dengue is everyone's responsibility

- Discard/destroy unused items (cups, tyres etc.)
- Do not allow stagnation of water more than a week. Drain out water from various containers, by regular changing of water plus cleaning flower vases and other items.
- Cover all water storage containers, tanks tightly.

# Lymphatic filariasis

## Targeted for elimination

### Key facts

- Nearly 1.4 billion people in 73 countries are threatened by lymphatic filariasis, commonly known as elephantiasis.
- Over 120 million people are currently infected, with about 40 million disfigured and incapacitated by the disease.
- Lymphatic filariasis can result in an altered lymphatic system and the abnormal enlargement of body parts, causing pain and severe disability. Acute episodes of local inflammation involving the skin, lymph nodes and lymphatic vessels often accompany chronic lymphedema.
- Several thousands, probably tens of thousands of bites by infective vector mosquitoes occur before a new human case is established. A high proportion of lymphatic filariasis cases are contracted in childhood years before microfilaraemia develops.
- To interrupt transmission, WHO recommends an annual mass drug administration of single doses of two medicines to all eligible people in endemic areas.
- India targets eliminating lymphatic filariasis by 2015. The disease is endemic in 15 states and five union territories (a total of 250 districts).

### Global burden

- An estimated 120 million people in tropical and sub-tropical areas of the world are infected with lymphatic filariasis (LF).
- Of these, almost 25 million men have genital disease (most commonly hydrocele) and almost 15 million, mostly women, have lymphedema or elephantiasis of the leg.
- Approximately 66% of those at risk of infection live in the WHO South-East Asia Region and 33% in the African Region.

### Burden in India

- The disease is endemic in 15 states and five union territories (a total of 250 districts) with approximately 600 million population at risk.
- There are 800 000 lymphedema and 400 000 hydrocele cases line listed in the states and union territories.

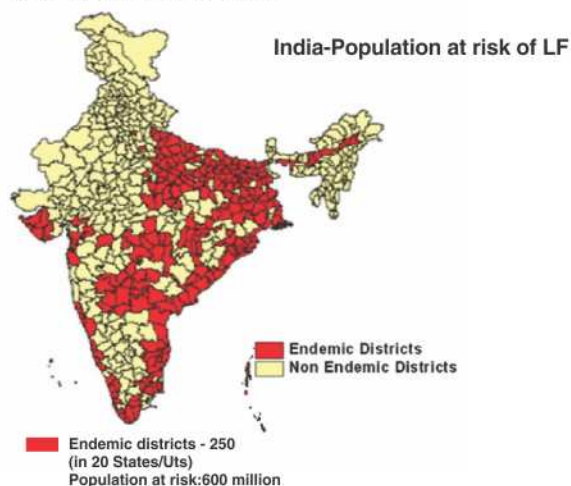


Figure: India – LF endemic districts  
Source: NVBDCP

### Risk factors and transmission

- LF is caused by infection with nematodes of the family Filarioidea: 99.4% of infections are caused by *Wuchereria bancrofti* and rest by *Brugia malayi*. The former is widely distributed, while the latter is restricted to Kerala. The transmission of lymphatic filariasis is through mosquitoes namely *Culex quinquefasciatus* and *Mansonia* species.
- Adult worms lodge in the lymphatic system and disrupt the immune system. They live for six-eight years and, during their lifetime, produce millions of microfilariae (small larvae) that circulate in the blood. Humans are the exclusive host of infection with *W. bancrofti*.

### Clinical presentations

- LF is a seriously debilitating and incapacitating disease. During the early phase, the infected person remains apparently healthy but serves as a source of infection for transmission. When lymphatic filariasis develops into chronic conditions, it leads to lymphedema (tissue swelling) or elephantiasis (skin/tissue thickening) of limbs and hydrocele (fluid accumulation). Breasts and genital organs are also affected but not common.
- Such body deformities lead to social stigma, as well as financial hardship from loss of income and increased medical expenses. The socio-economic burdens of isolation and poverty are immense.



Figure: Lymphedema Source  
Dr Asheena/WHO

## Treatment

- The recommended treatment is DEC 6 mg per kg body weight for 12 days. Mass drug administration with DEC+albendazole single dose annually for five or more years is recommended to liquidate parasite load and interrupt transmission.

WHO recommends mass administration of a combination of medicines (diethylcarbazine + albendazole) to all eligible individuals in countries not co-endemic for onchocerciasis.

- Relatively simple and well known surgical procedures are available to correct hydrocele.
- Simple hygiene measures—either alone or in combination with antibiotic treatment—play an important role in preventing episodes of acute disease and in the management of lymphoedema. Daily washing of affected limbs with soap and safe water to prevent secondary infection, combined with simple exercises, elevation of the limb, and treatment of cracks and entry points, provides significant relief from acute episodes and slows progression of the disease.



Mass drug administration  
Source: NVBDCP



Daily washing of affected limbs with soap and water helps prevent secondary infection. It is important to take a clean cloth and pay extra attention to drying carefully in between the toes and folds. It is also recommended to elevate and exercise the swollen arm or leg to improve lymph flow.

Source: NVBDCP

## Prevention and control

- Avoidance of mosquito bites through personal protection measures or community-level vector control is the best option to prevent lymphatic filariasis. Periodic examination of blood for infection and initiation of recommended treatment are also likely to prevent clinical manifestations.
- The World Health Assembly in 1997 adopted resolution, WHA 50.29, for Elimination of Lymphatic Filariasis (ELF) as a global public health problem by 2020.

WHO recommends four sequential programmatic steps to eliminate lymphatic filariasis through MDA:

1. Mapping the geographical distribution of the disease.
2. MDA for five years or more to reduce the number of parasites in blood to levels that will prevent mosquito vectors from transmitting infection.
3. Post-MDA surveillance after MDA is discontinued.
4. Verification of elimination of transmission.

## National programme strategies

- LF has been targeted for elimination by 2015 by progressively reducing and ultimately interrupting the transmission and preventing and reducing disability amongst affected persons through disability alleviation and morbidity management.
- The strategy of annual mass drug administration with annual single recommended dose of DEC+albendazole tablets is being implemented in the country in 250 endemic districts since 2004. The anti-larval operations are ongoing in 227 towns covered under the National Filaria Control Programme and 131 towns under Urban Malaria Scheme.
- Transmission assessment survey (TAS) is being carried out in phased manner to cover all 250 districts and four national workshops on TAS have been conducted and 139 programme officers have been trained during 2013. So far nine evaluation units (per two million population) have successfully cleared TAS and another 45 are planned in 2013-2014.
- The coverage of population during MDA is more than 80% and about 186 districts (74.4%) have achieved the target of less than 1% microfilaria prevalence. Also, 65 districts have already been surveyed and found to be very low endemic/non-endemic. Identification of lymphedema and hydrocele cases in the villages are being done by involving ASHAs or health workers.
- In addition, scaling up of home based foot care and hydrocele operation have been initiated for disability alleviation in the identified hospitals/medical colleges.

## WHO recommends

- Enhanced priority and commitment is needed if India aims to eliminate the disease by 2015.
- The principal challenge for the filariasis elimination programme is the delivery of the drug to the populations of endemic communities and to sustain annual delivery and high treatment coverage for a sufficiently long period to bring about the elimination of the disease.
- Supervised drug administration for better compliance is challenged by large population to be covered especially in urban areas. There is need for greater involvement of local leaders and volunteers for MDA as well as for quality IEC/behavior change communication activities in local languages for inter-personal communication.
- WHO recommends validation through ICT cards for phasing out of MDA. Availability and cost of ICT is a limiting factor and a major challenge.
- Greater engagement of faculty from medical colleges and research institutions for monitoring and independent assessment of the programme.
- Morbidity management and disability prevention are vital for public health improvement and should be fully integrated into the health system.



IEC campaign for MDA

Source: NVBDCP

# Visceral leishmaniasis (Kala-azar)

## Targeted for elimination

### Key facts

- Kala-azar (KA), also known as visceral leishmaniasis (VL), is an infectious disease caused by the *Leishmania* parasite when it is transmitted by the bite of an infected sandfly.
- KA is fatal when untreated.
- There are approximately 400 000 new cases every year worldwide, the majority of which occur in Bihar, India, followed by the border regions of Bangladesh and Nepal.
- These figures do not reflect the true social impact of this disease because KA has a focal distribution that affects primarily the poorest communities.
- Although no vaccine is available, important recent advances have made it possible to eliminate KA from the Indian subcontinent. India targets KA elimination by 2015.

### Global disease burden

- An estimated 200 000 to 400 000 new cases of visceral leishmaniasis (VL) occur worldwide each year.
  - Over 90% of new cases occur in six countries: Bangladesh, Brazil, Ethiopia, India, South Sudan and Sudan. In the South-East Asia region, countries affected by leishmaniasis include India, Bangladesh and Nepal with sporadic cases in Bhutan and Thailand.
  - The disease affects the poorest and most vulnerable and is associated with malnutrition, population displacement, poor housing, weak immune system, and lack of resources.
- Largest burden (> 80% cases) contributed by Bihar (33 out of 38 districts), West Bengal (11 endemic districts) followed by Uttar Pradesh (six districts) and Jharkhand (four districts).
  - Sporadic cases reported from Gujarat, Uttarakhand, Himachal Pradesh, Punjab, Sikkim, Assam and Delhi.

### Risk factors for transmission

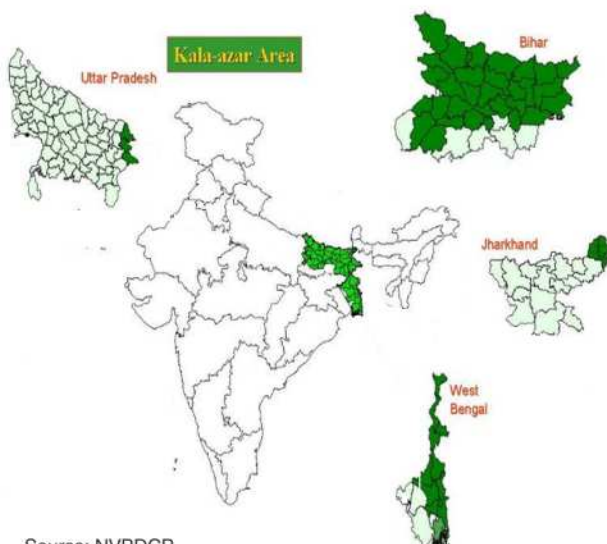
- Leishmaniasis is caused by a protozoa parasite of *Leishmania* species and transmitted through the bites of infected female phlebotomine sandflies.



Sandfly  
Source: WHO

### Burden in India

- Over 165 million people in India live in 54 endemic districts for kala-azar in eastern states of India, namely Bihar, Jharkhand, Uttar Pradesh and West Bengal.



Source: NVBDCP

Sandfly breeds and transmits in rural areas with a heavy annual rainfall and alluvial soil. Agricultural villages where houses are constructed with mud walls and earthen floors, and cattle/other livestock live close to humans, are breeding grounds. The insect is small (only about one-third the size of mosquito), does not make any noise and bites might not be noticed. They usually are most active during twilight, evening, and night-time hours (from dusk to dawn).

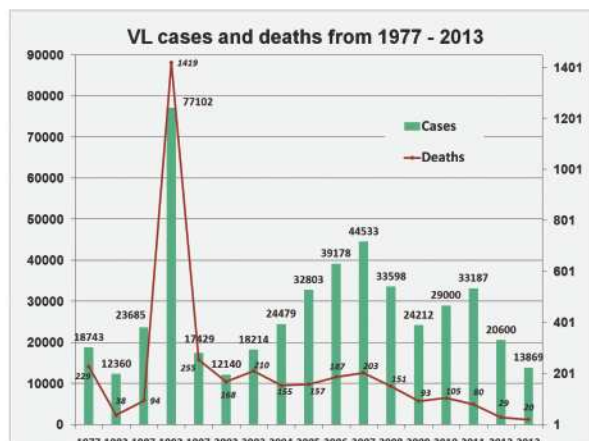
## Clinical presentation

- Visceral leishmaniasis also called kala-azar is a slow progressing disease that presents with fever of long duration (more than two weeks) with enlargement of spleen, anemia and progressive weight loss.
- In endemic areas, children and young adults are its principal victims. Without timely treatment, the disease is fatal and can be as high as 100% within two years.
- Leishmaniasis may also occur in its cutaneous or muco-cutaneous form. Post kala-azar dermal leishmaniasis (PKDL) is sequelae of VL characterized by the occurrence of a skin rash after an episode of VL. PKDL patients may play an important role in transmission.

## National programme strategies

The National Kala-azar Control Programme launched in 1990-91, merged with the National Rural Health Mission (NRHM, now National Health Mission) in the year 2005 under the National Vector Borne Disease Control Programme (NVBDCP).

- The national health policy (2002) had set a goal to eliminate kala-azar by the year 2010, which could not be attained.
- In its 12th Five Year Plan, the programme targets KA elimination (reducing incidence to <1 case per 10 000 population at sub-district level (block level) by 2015.
- This is also aimed in the tripartite MoU between WHO (South-East Asia Regional Office) and three countries namely, Nepal, Bangladesh and India. This will be renewed at the next World Health Assembly along with Bhutan and Thailand, which have also seen cases recently.



Source: NVBDCP

- Programme strategies include case identification by rapid diagnostic kit followed by case management by oral drug miltefosine (28 days course schedule) and drug amphotericin B injection for children < two years, pregnant women and child bearing women, integrated vector control through indoor residual spray (IRS) and accelerated IEC/BCC. In 2014, the programme has introduced combination treatment with miltefosine+paromomycin (10 days course schedule) at block level and single dose amBisome injection at district hospital/referral centers. Passive reporting of kala-azar cases happens through existing primary health care system supplemented with periodic quarterly active camp searches/ kala-azar fortnight for case detection followed by free treatment.

- Loss of wages to KA patients and free diet to patient and one attendant during treatment period being provided.
- Frontline workers such as ASHA have been engaged for early case identification and better management with suitable incentive.

## Continuing challenges

- Poor coverage and quality of indoor residual spraying, including issues of community acceptance (including refusal).
- Monitoring and supervision capacity especially in the endemic districts needs to be intensified.
- Stock-outs for rapid diagnostic kits for kala-azar and miltefosine capsules at some places.



Active camp search in Garaul Block Muzaffarpur (Bihar)  
Source: NVBDCP

## WHO recommends

- Accelerated actions for early detection and treatment of kala-azar cases in the endemic districts are critical if India aims to eliminate this disease by 2015. More intensive monitoring of the programme activities, including vector surveillance and IRS is needed.
- Miltefosine as monotherapy be replaced by single dose liposomal Amphotericin B for kala-azar as it is safer and more effective and ensures 100% compliance. This is being introduced in seven high-endemic districts on pilot basis.
- Pharmacovigilance data should be collected for all the drugs used in the programme. These recommendations are being considered for KA elimination by the Government of India.

# Japanese encephalitis

## A serious challenge for India

### Key facts

- Japanese encephalitis (JE) virus is the leading cause of vaccine-preventable encephalitis in Asia and the Western Pacific.
- For most travelers to Asia, the risk for JE is very low but varies based on destination, duration of travel, season, and activities.
- JE virus is maintained in a cycle involving mosquitoes and vertebrate hosts, mainly pigs and wading birds. Humans can be infected when bitten by an infected mosquito.
- Most human infections are asymptomatic or result in only mild symptoms.
- However, a small percentage of infected persons develop inflammation of the brain (encephalitis), with symptoms including sudden onset of headache, high fever, disorientation, coma, tremors and convulsions. About one in four cases are fatal. Neurologic or psychiatric sequelae are seen in 30%-50% of survivors.
- There is no specific treatment for JE. Patient management focuses on supportive care and management of complications.
- Steps to prevent JE include using personal protective measures to prevent mosquito bites and vaccination.

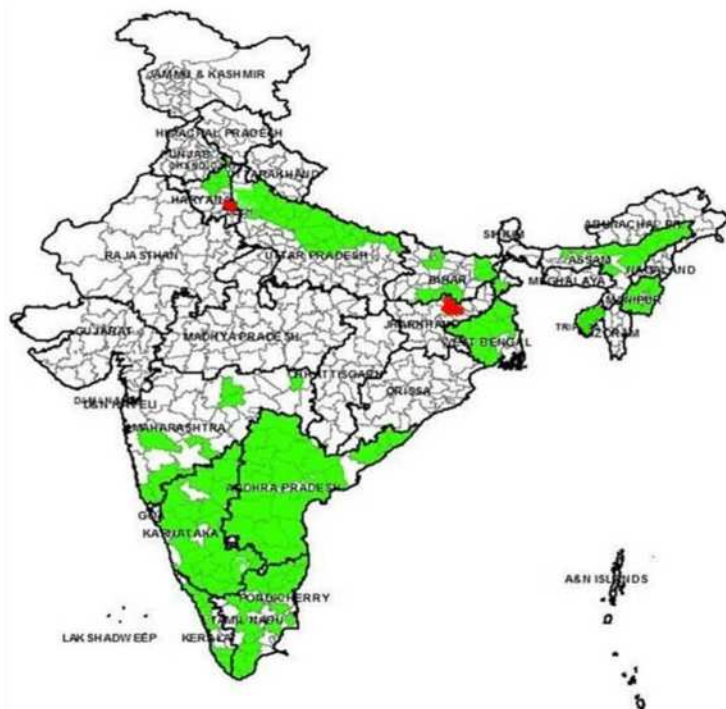
### Global burden

- Japanese encephalitis, a mosquito-borne flavivirus infection is a severe disease that involves inflammation of the brain.
- It is major public health problem and is endemic with seasonal distribution in parts of China, the Russian Federation's south-east, and South and South-East Asia.
- Japanese encephalitis virus is a leading cause of encephalitis in Asia, causing an estimated 68 000 JE cases annually (with up to 20 400 deaths) at least 30% of which result in permanent neuropsychiatric sequelae.
- JE primarily affects children. Most adults in endemic countries have natural immunity after childhood infection, but individuals of any age may be affected.

### Burden in India

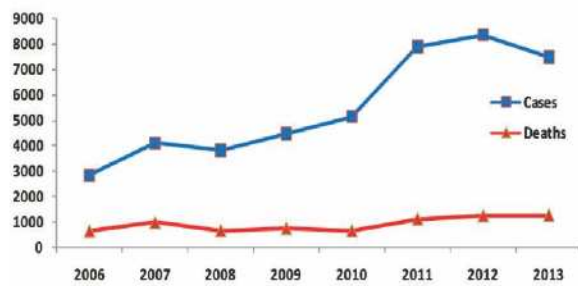
- Japanese encephalitis is a severe disease and its epidemics are reported from many parts of India. The number of cases and deaths of AES (Acute Encephalitis Syndrome) have been increasing every year.
- During 2013, 7478 AES, including JE cases and 1270 deaths have been reported from states of Andhra Pradesh, Assam, Bihar, Goa, Haryana, Jharkhand, Karnataka, Kerala, Manipur, Nagaland, Tamil Nadu, Uttar Pradesh and West Bengal.

- Out of the total AES cases reported, 1079 were JE positive with 199 deaths during the year 2013.
- Out of the total AES/JE cases and deaths reported in the country more than 85% are contributed by five states, namely Assam, Bihar, Tamil Nadu, Uttar Pradesh and West Bengal. Uttar Pradesh and Assam contribute 81% of total JE burden in the country.



Geographic expansion of JE in India  
Source: NVBDCP

## AES including JE cases and death since 2006



Source: NVBDCP

## Risk factors and transmission

- JE virus, a flavivirus, is transmitted to humans through the bite of infected *Culex species* mosquitoes, particularly *Culex tritaeniorhynchus*.
- The virus is maintained in a cycle between mosquitoes and vertebrate hosts, primarily pigs and wading birds.
- Humans are incidental or dead-end hosts, because they usually do not develop high enough concentrations of JE virus in their bloodstreams to infect feeding mosquitoes.
- JE virus transmission occurs primarily in rural agricultural areas, often associated with rice production and flooding irrigation. In some areas of Asia, these conditions can occur near urban centers.
- In temperate areas of Asia, JE virus transmission is seasonal. Human disease usually peaks in the summer and fall. In the subtropics and tropics, transmission can occur year-round, often with a peak during the rainy season.
- The patients who are infected with JE/AES in India come from a poor socio-economic background with illiteracy, poverty and other socio-demographic factors with a large proportion of afflicted patients being malnourished. These patients hail from villages with almost no sanitation facilities and unfavorable environmental conditions.

## Clinical presentations

- Less than 1% of people infected with JE virus develop clinical illness.
- In persons who develop symptoms, the incubation period (time from infection until illness) is typically five to 15 days.
- Initial symptoms often include fever, headache and vomiting.
- Mental status changes, neurologic symptoms, weakness and movement disorders might develop over the next few days.
- Seizures are common, especially among children.

## Treatment

- Treatment is symptomatic. Rest, fluids, and use of pain relievers and medication to reduce fever may relieve some symptoms. No specific treatments have been found to benefit patients with JE, but hospitalization for supportive care and close observation is generally required.
- Among patients who develop encephalitis, 20%-30% die.
- Although some symptoms improve after the acute illness, 30%-50% of survivors continue to have neurologic, cognitive or psychiatric symptoms.



A child with JE encephalitis receiving supportive treatment in Uttar Pradesh.  
Source: Dr Asheena/WHO

## Prevention and control

- The disease is predominantly found in rural and periurban settings. Strong prevention and control activities include strengthening JE immunization through routine immunization in all areas where the disease is a recognized public health problem, along with strengthening surveillance and reporting mechanisms.
- Recently, prospects for control have improved with better disease burden awareness, as a result of increased JE surveillance and wider availability of safe, effective vaccines. A Chinese vaccine has recently been pre-qualified by WHO.
- Patients need supportive care and rehabilitation support. Early case detection and case referrals is the cornerstone of case management.

## National programme strategies

The goal of the national programme is to reduce morbidity, mortality and disability in children due to JE/AES.

- At present out of 171 JE endemic districts, 132 districts have been brought under vaccination by giving single dose of SA - 14-14-2 vaccine, which is imported from China. To further improve vaccination coverage, since 2013, two doses of vaccine are given under routine immunization under Universal Immunization Programme (UIP), first dose at the age of nine months and second dose with the booster dose of DPT.
- A multi-pronged strategy for prevention and control of JE and AES recommended by group of ministers was approved by the cabinet on 18 October 2012 and clear roles of various ministries have been identified for inter-sectoral coordination.
- The strategy will be implemented in 60 priority districts for a period of five years from 2012-13 to 2016-17 by the ministries of Health & Family Welfare, Drinking Water & Sanitation, Social Justice & Empowerment, Housing & Urban Poverty Alleviation and Women & Child Development.

Focused interventions will be done in five states, Assam, Bihar, Tamil Nadu, Uttar Pradesh and West Bengal.

## Components of JE/AES control in India include:

- Strengthening and expanding JE vaccination in affected districts.
- Strengthening surveillance, vector control, case management and timely referral of serious and complicated cases.
- Increasing access to safe drinking water and proper sanitation facilities to the target population in affected rural and urban areas.
- Estimate disability burden due to JE/AES and to provide for adequate facilities for physical medical neurological and social rehabilitation.
- Improve nutritional status of children at risk of JE/AES.
- Carry out intensified IEC/BCC activities regarding JE/AES.

## WHO recommends

Strong JE prevention and control activities, including strengthening JE immunization through routine immunization in all areas where the disease is a recognized public health problem.

- In India, quality surveillance for acute encephalitis syndrome, including laboratory testing, is necessary for understanding the epidemiology and etiology of AES, planning interventions, and developing policy along with strengthening reporting mechanisms.
- Early case management and supportive care of the patients is critical.
- Rehabilitation centers at district hospitals and management of JE/AES cases need to be strengthened in an integrated service delivery setup.

# Chikungunya

## A continuing problem

### Key facts

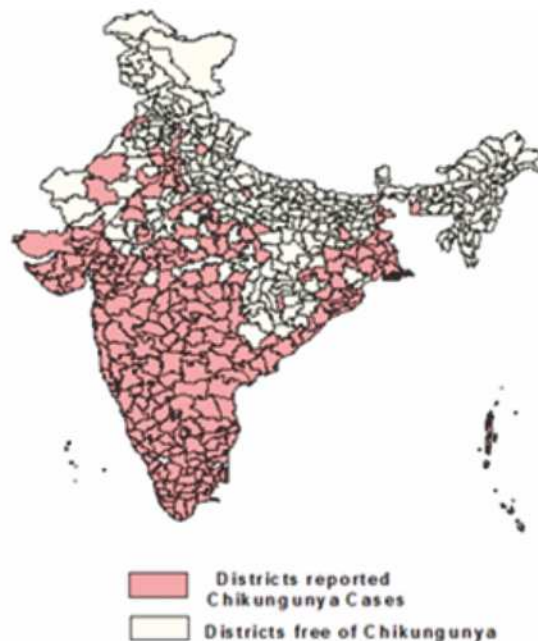
- Chikungunya is a viral disease transmitted to humans by infected mosquitoes. It causes fever and severe joint pain. Other symptoms include muscle pain, headache, nausea, fatigue and rash.
- The disease shares some clinical signs with dengue, and can be misdiagnosed in areas where dengue is common.
- There is no cure for the disease. Treatment is focused on relieving the symptoms.
- The proximity of mosquito breeding sites to human habitation is a significant risk factor for chikungunya.
- Since 2004, chikungunya fever has reached epidemic proportions, with considerable morbidity and suffering.
- The disease occurs in Africa, Asia and the Indian subcontinent. In recent decades, mosquito vectors of chikungunya have spread to Europe and the Americas. In 2007, disease transmission was reported for the first time in a localized outbreak in north-eastern Italy.
- In India, it re-emerged in 2006 after a quiescence of three decades as an epidemic.

### Global burden

- Chikungunya is a mosquito-borne viral disease first described during an outbreak in southern Tanzania in 1952. It is an RNA virus that belongs to the alpha virus genus of the family Togaviridae. The name 'chikungunya' derives from a word in the Kimakonde language, meaning "to become contorted" and describes the stooped appearance of sufferers with joint pain (arthralgia).
- The disease occurs in Africa, Asia and the Indian subcontinent. In recent decades, mosquito vectors of chikungunya have spread to Europe and the Americas.
- A large chikungunya outbreak emerged in the Indian Ocean Islands during 2005-2006 including Comoros, Mayotte, Mauritius, Seychelles and particularly Reunion Island where 35% of 770 000 inhabitants were infected in six months.
- In 2007, disease transmission was reported for the first time in a localized outbreak in north-eastern Italy.

### Burden in India

- India experienced massive outbreaks of chikungunya in 1960s and early 1970s mainly in cities. After a gap of 32 years (in 2006), an explosive outbreak of chikungunya devastated the country affecting more than 1.4 million people in 13 states.



Source: NVBDCP

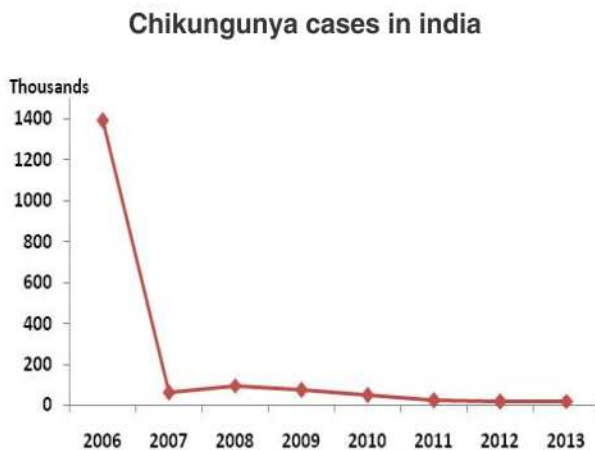
### Risk factors and transmission

- The virus is transmitted from human to human by the bites of infected female mosquitoes. Most commonly, the mosquitoes involved are *Aedes aegypti* and *Aedes albopictus*, two species, which can also transmit other mosquito-borne viruses, including dengue. These mosquitoes can be found biting throughout daylight hours, though there may be peaks of activity in the early morning and late afternoon. Both species are found biting outdoors, but *Ae. aegypti* will also readily feed indoors.

- *Ae. aegypti* is more closely associated with human habitation and uses indoor breeding sites, including flower vases, water storage vessels and concrete water tanks in bathrooms, as well as the same artificial outdoor habitats as *Ae. albopictus*.
- After the bite of an infected mosquito, onset of illness occurs usually between four and eight days but can range from two to 12 days.

## Clinical presentations

- Chikungunya is characterized by an abrupt onset of fever frequently accompanied by joint pain. Other common signs and symptoms include muscle pain, headache, nausea, fatigue and rash. The joint pain is often very debilitating, but usually lasts for a few days or may be prolonged to weeks.
- Most patients recover fully, but in some cases joint pain may persist for several months, or even years. Occasional cases of eye, neurological and heart complications have been reported, as well as gastrointestinal complaints.
- Serious complications are not common and chikungunya rarely causes death. But in older people, the disease can contribute to the cause of death. Often symptoms in infected individuals are mild and the infection may go unrecognized, or be misdiagnosed in areas where dengue occurs.



Source: NVBDCP

## Treatment

There is no specific antiviral drug treatment for chikungunya. Treatment is directed primarily at relieving the symptoms, including the joint pain using anti-pyretics, optimal analgesics and fluids.

There is no commercial chikungunya vaccine.

## Prevention and control

- The proximity of mosquito vector breeding sites to human habitation is a significant risk factor for chikungunya as well as for other diseases that these species transmit.
- Prevention and control of chikungunya relies heavily on reducing the number of natural and artificial water-filled container habitats that support breeding of mosquitoes. This requires mobilization of affected communities.
- For protection during outbreaks of chikungunya, clothing, which minimizes skin exposure to the day-biting vectors is advised. Repellents can be applied to exposed skin or to clothing in strict accordance with product label instructions.
- For those who sleep during the daytime, particularly young children, or sick or older people, insecticide treated mosquito nets afford good protection. Mosquito coils or other insecticide vaporizers may also reduce indoor biting.
- Basic precautions should be taken by people travelling to risk areas and these include use of repellents, wearing long sleeves and pants and ensuring rooms are fitted with screens to prevent mosquitoes from entering.

## National programme strategies

The current strategic plan for chikungunya and dengue under the National Vector Borne Disease Control Programme (NVBDCP) has eight key elements, called as 'Octalogue', which includes both disease and entomological surveillance, epidemic preparedness, behaviour change communications etc.

Diagnostic facilities (secondary and tertiary level hospitals) have been identified as sentinel laboratories under the programme, which are linked to 14 Apex Referral Laboratories.

## WHO recommends

- India continues to strengthen effective management of cases and outbreaks of chikungunya in the country.
- Improve disease surveillance and reporting systems, including effective reporting of key findings of the outbreak locally as well as the state, regional and national levels.
- Invest in strengthening vector surveillance and diagnosis and vector control at sub-national level.
- Developing capacity at the medical colleges (Diagnostic Virology Network Laboratories) to identify early signs of impending outbreaks.



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