




DENGUE

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Dengue - Epidemiology & Aedes Mosquito



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Introduction

- Dengue fever (DF) is the most common mosquito-borne viral disease of humans that in recent years has become a major international public health concern.
- Dengue Hemorrhagic fever (DHF) is a potentially lethal complication of DF.



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Problem statement

- DHF was first recognized in the 1950s during the dengue epidemics in the Philippines and Thailand.
- By 1970 nine countries had experienced epidemic DHF and in 1995 the number has increased more than fourfold and continues to rise.



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- **WORLD:**
- **Population at risk:** 2500 million people -- two fifths of the world's population
- **Dengue infection every year:** 100 million
Cases of DHF : 500,000
- **CFR** as high as 5%.
- **Cases of DHF requiring hospitalization each year :** 0.5 million cases of DHF (of whom a very large proportion are children).



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A study in **South East Asia** estimated

- A loss of 420 DALYs per million population per year, comparable to
 - Meningitis (390 DALYs per million population per year),
 - Twice the burden of hepatitis and
 - One-third of the burden imposed by HIV-AIDS in the region.



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In **India**, the first major outbreak associated with DHF occurred in

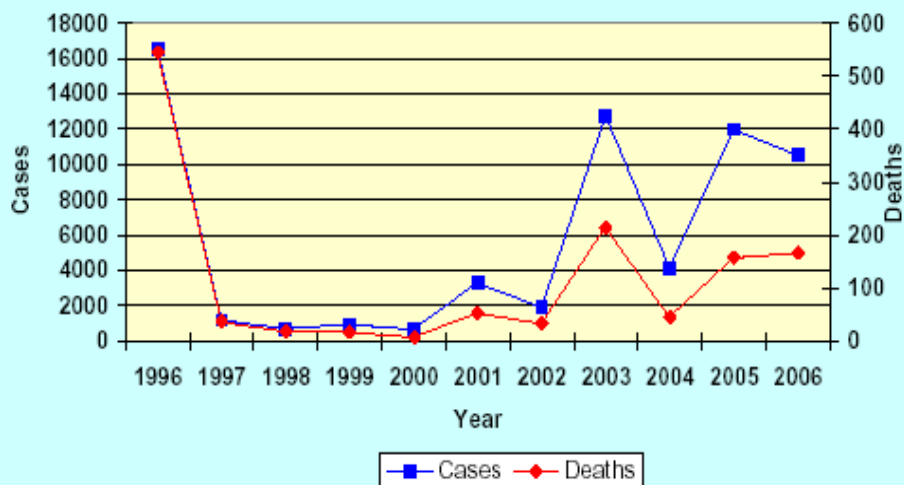
- Calcutta in 1963 followed by
- Outbreaks in Delhi in 1996, 2003 and 2006.
- Not only is the number of cases increasing as the disease is spreading to new areas, but explosive outbreaks are occurring.



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Trends in India

Denque cases & deaths in India from 1996 to 2006

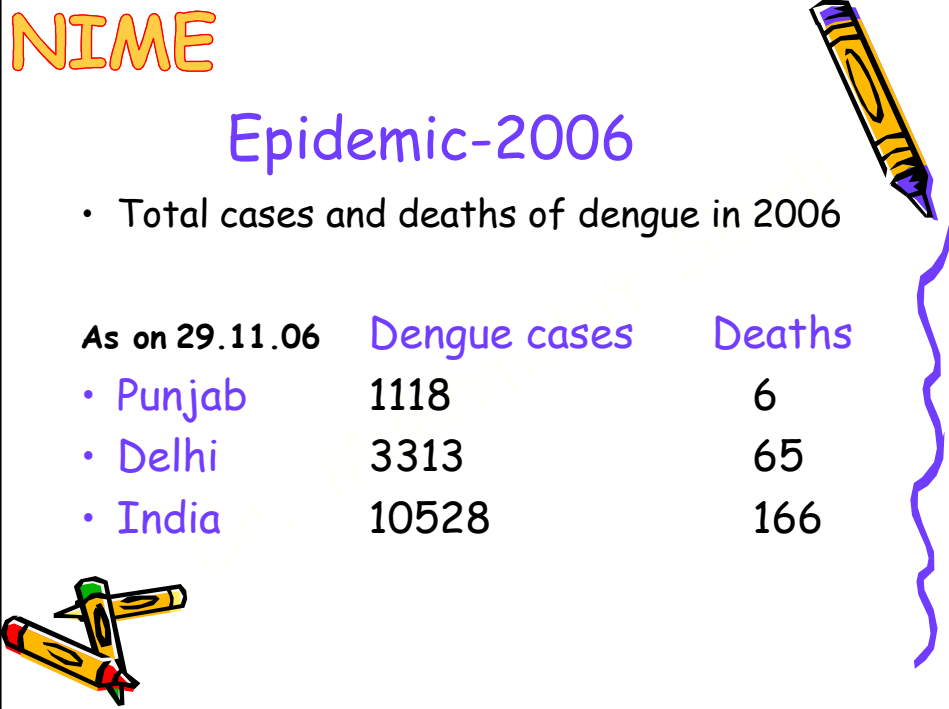


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Epidemic-2006

- Total cases and deaths of dengue in 2006

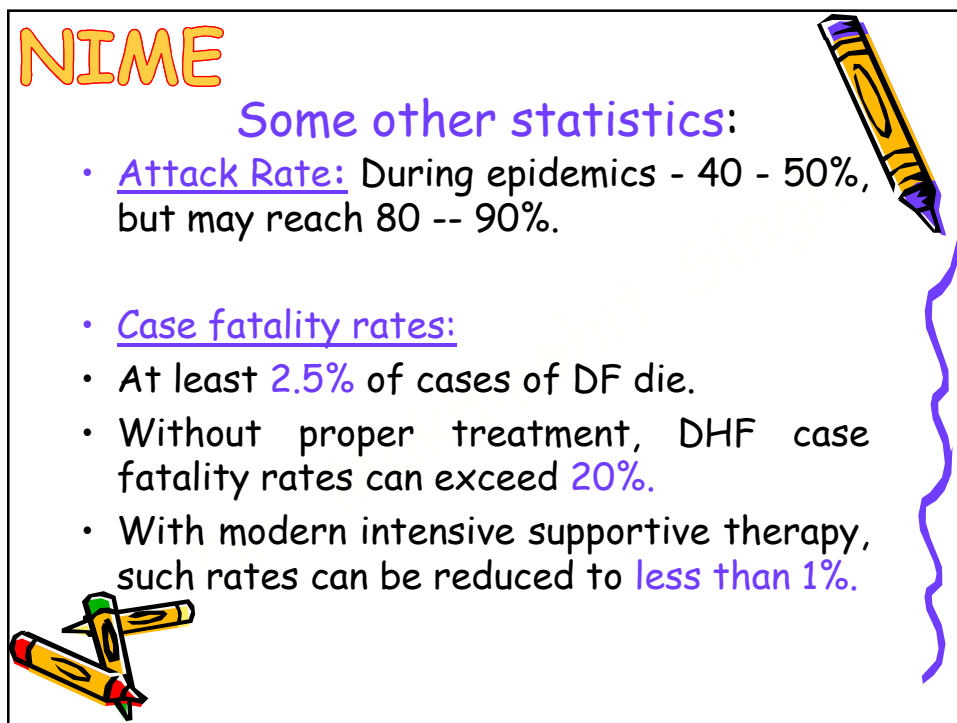
As on 29.11.06	Dengue cases	Deaths
• Punjab	1118	6
• Delhi	3313	65
• India	10528	166



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Some other statistics:

- Attack Rate: During epidemics - 40 - 50%, but may reach 80 -- 90%.
- Case fatality rates:
 - At least 2.5% of cases of DF die.
 - Without proper treatment, DHF case fatality rates can exceed 20%.
 - With modern intensive supportive therapy, such rates can be reduced to less than 1%.



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Agent factor

- DF/DHF is caused by Flavivirus : Dengue Virus
- It is estimated that within past 500 years the four dengue viruses namely-type 1, 2, 3, 4 emerged separately from the sylvatic cycle to become pathogens of human beings.



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Host factor

- **Age:** All ages are susceptible. 66% cases occur in age group 15-45 years and 3-40% cases occur in 6 - 15 yrs.
- **Sex:** Males are more prone.
Male : Female = 2 : 1
- **Residence:** Urban and semi-urban areas with high population density, poor sanitation, many coolers, OHT, construction sites etc are at high risk.



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- Immunity to a single dengue virus is lifelong, but infection with 2nd, 3rd and 4th serotypes can occur.
- When a person has had Classical dengue (by one serotype), a second infection later increases the likelihood of DHF.
- Severity of dengue is less in patients with Protein Calorie Malnutrition.

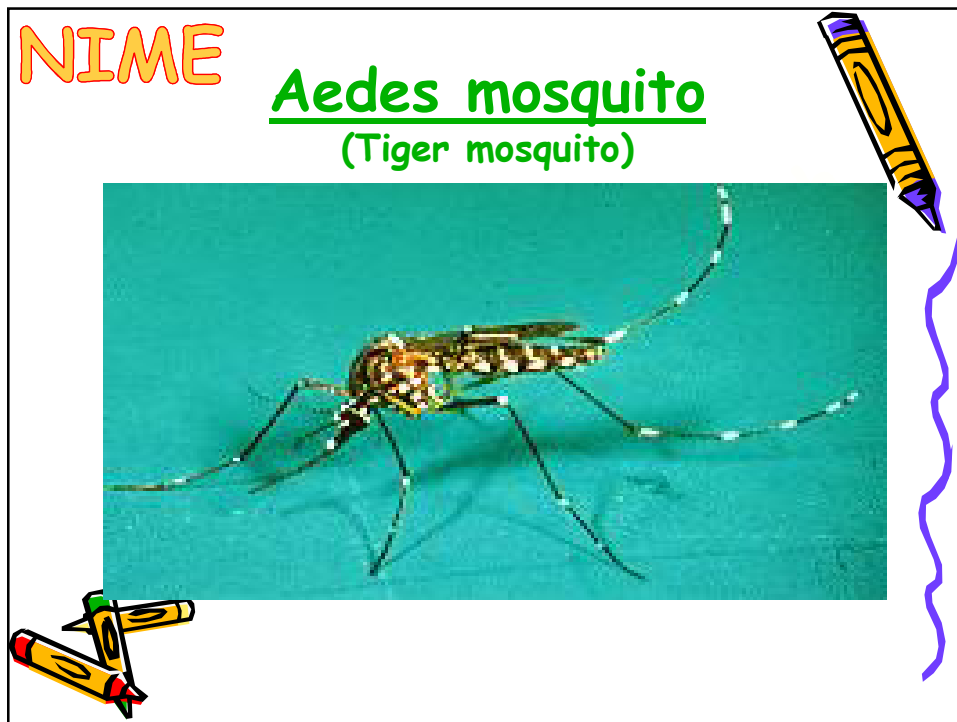


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Transmission


- The spread of dengue is attributed to expanding geographic distribution of the four dengue viruses and of their mosquito vectors, the most important of which is the predominantly urban species *Aedes aegypti*.





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- Bites of infective female *Aedes* mosquitoes.
- Appearance: White stripes on black body.
(Tiger Mosquito)
- Peak biting is during the daytime.
- Distance of flight: 400 m
- Height of flight: 60 m
- At temperature less than 26° C, mosquito fails to transmit dengue virus.



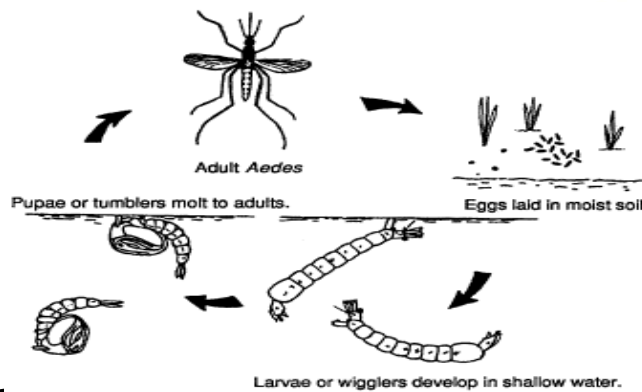
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- Season: Post monsoon period
- It rest indoor on various objects, in closets and other dark places, outside they rest in cool and shady places.
- The average lifespan of an Aedes mosquito in nature is 2 weeks
- Transovarian transmission is also seen



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Life cycle



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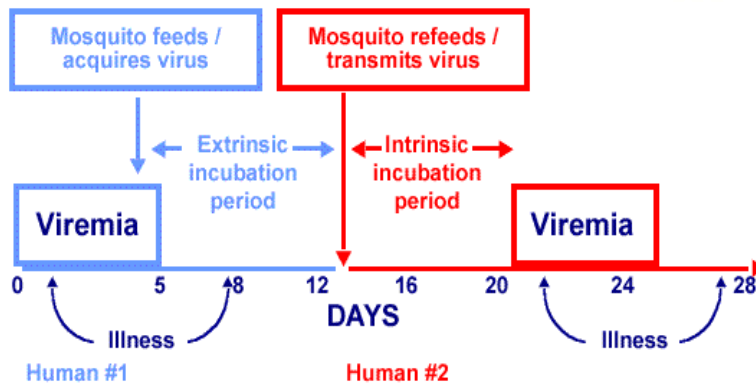
Life cycle of Aedes

- **Oviposition** Females lay their eggs singly on the sides of the container at the water line in batches of 30-50.
- **Eggs:** High humidity for 2-3 days is reqd for larvae to hatch from the eggs.
- **Larvae:** The 4 larval stages (instars) take 5-10 days for development (some texts say 5-7 days).
- **Pupae:** From pupal to adult stage - 2-3 days.
- **Adults:** Life span is between 2 weeks to month.
- Under the most favorable climatic and environmental conditions, the entire immature or aquatic cycle (i.e., from egg to adult) can occur in as little as 10 days.



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Transmission



<http://www.cdc.gov/ncidod/dvbid/dengue/slideset/set1/i/slide04.htm>

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- *Aedes aegypti* bites a dengue-infected person who is having viremia that lasts for about 5 days.
 - Virus replicates in the mosquito during an **extrinsic incubation period** of 8 - 12 days.
 - The mosquito then bites a susceptible person and transmits the virus
 - The virus then replicates in the second person and produces symptoms. The symptoms begin to appear an average of four to seven days after the mosquito bite—this is the **intrinsic incubation period**, within humans.
- Humans are the main amplifying host.



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Aedes aegypti breeds primarily in :

- **Man-made containers** like earthenware jars, metal drums and concrete cisterns used for domestic water storage,
- **Discarded plastic food containers**, used automobile tyres and other items that collect rainwater.
- In Africa it also breeds extensively in natural habitats such as **tree holes and leaf axils**.



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Dengue- a price of development

More automobiles: more tyres : more breeding place

More disposable utensils: more breeding place

Aedes albopictus, is a secondary dengue vector in Asia. Its rapid spread is attributed to the international trade in used tyres.

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Water storage containers



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Aedes Aegypti Index

- Ratio (as %)

Number of houses in an area where actual breeding of *Aedes Aegypti* are found

Total number of houses examined

It should be zero at all ports



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Operational failure

- Adequate infrastructure to control the mosquitoes is present in India but there is operational failure.
- We are having effective tools to control malaria and if they had been fully utilized, then the spread of dengue would not have occurred.



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National Vector Borne Disease Control Programme (NVBDCP)

- It is an umbrella programme for prevention and **control** of **Vector Borne** Diseases namely
 - Malaria,
 - Filaria,
 - Kala-Azar,
 - Dengue
 - Chikungunya and
 - Japanese Encephalitisprevalent in the country.



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Key elements of Integrated vector management

- Advocacy
- Social mobilization and legislation
- Collaboration within the health sector and with other sectors
- Integrated approach-Vector control & multi-disease management
- Evidence based decision making and capacity building, monitoring, supervision, advocacy



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Summary

- Thus, the global prevalence of dengue has increased significantly in recent decades.
- Vaccine is not likely to be prepared in next 10 years. So, what must be done must be considered seriously.
- **Dengue is not a stand alone program.**
- Strict surveillance must be there in order to combat this disease.

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THANK YOU

