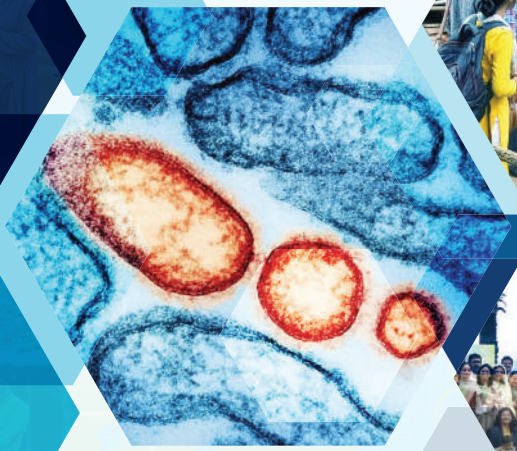
स्वास्थ्य एवं
परिवार कल्याण मंत्रालय
MINISTRY OF
HEALTH AND FAMILY WELFARE
सत्यमेव जयते

Azadi Ka Amrit Mahotsav

G20 भारत 2023 INDIA

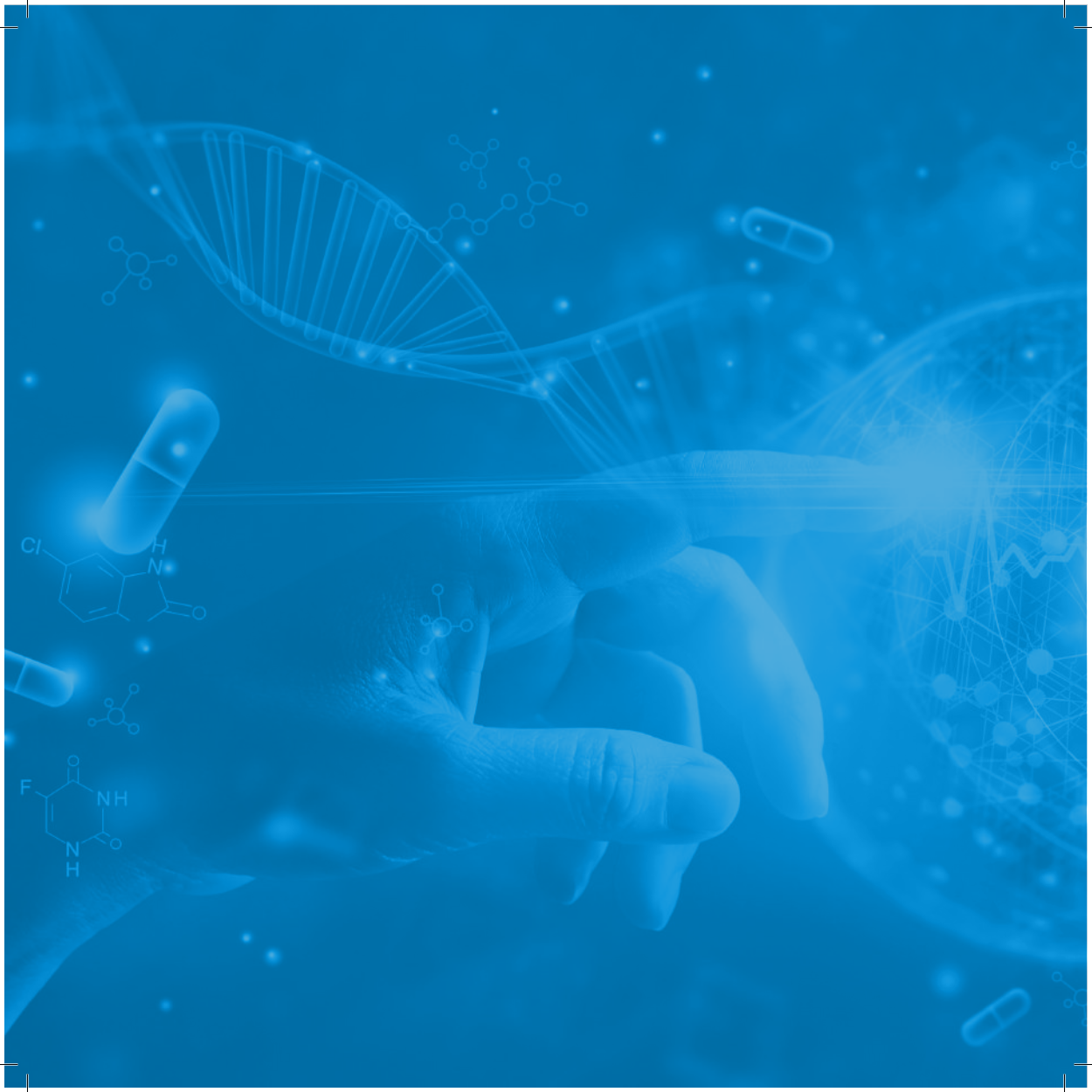


GUIDEBOOK FOR MEDICAL OFFICERS

Diagnosis and Management of Outbreak Prone Diseases

National Centre for Disease Control
Government of India
22-Sham Nath Marg, Delhi-110 054

Integrated Disease Surveillance Programme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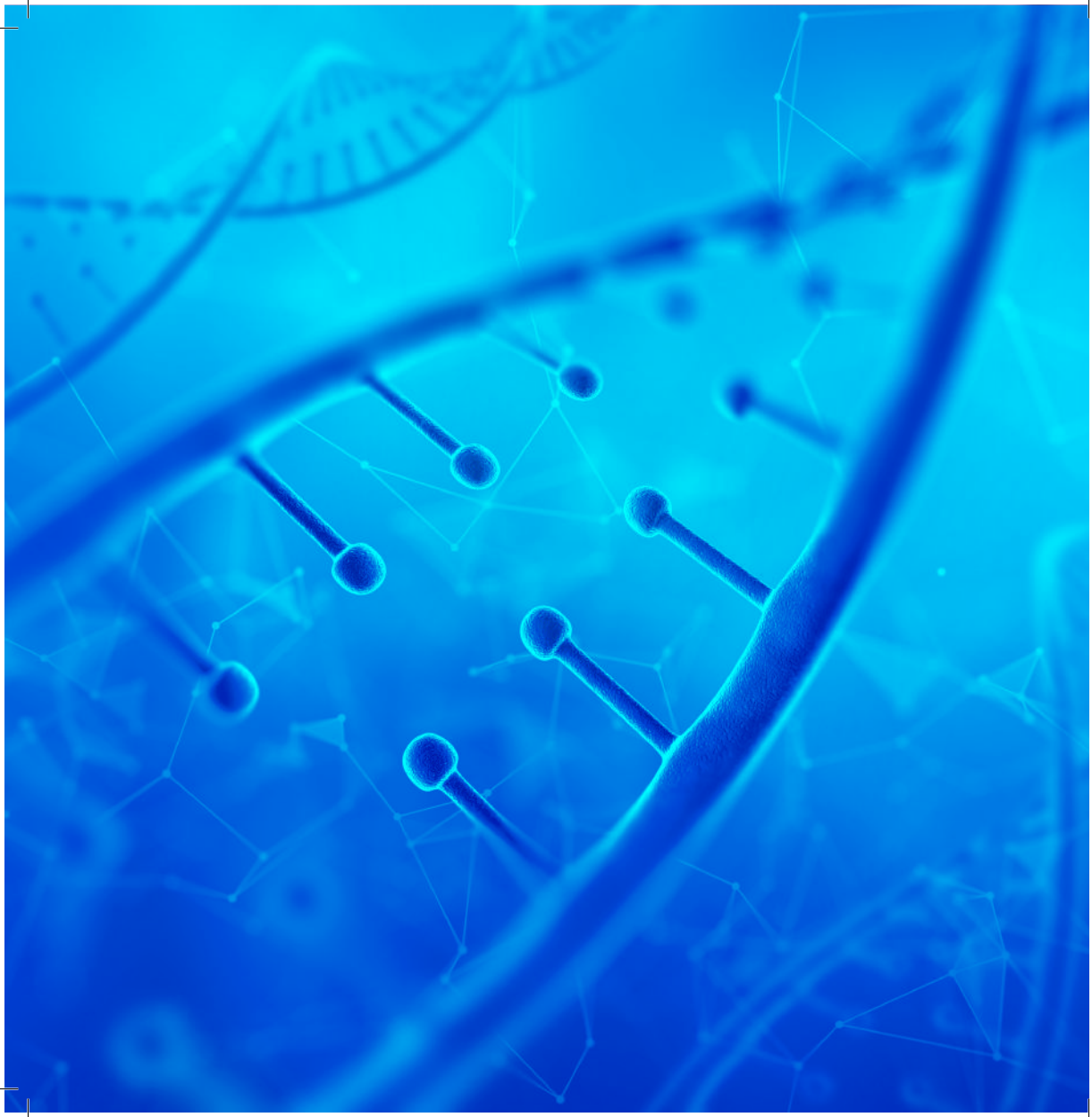
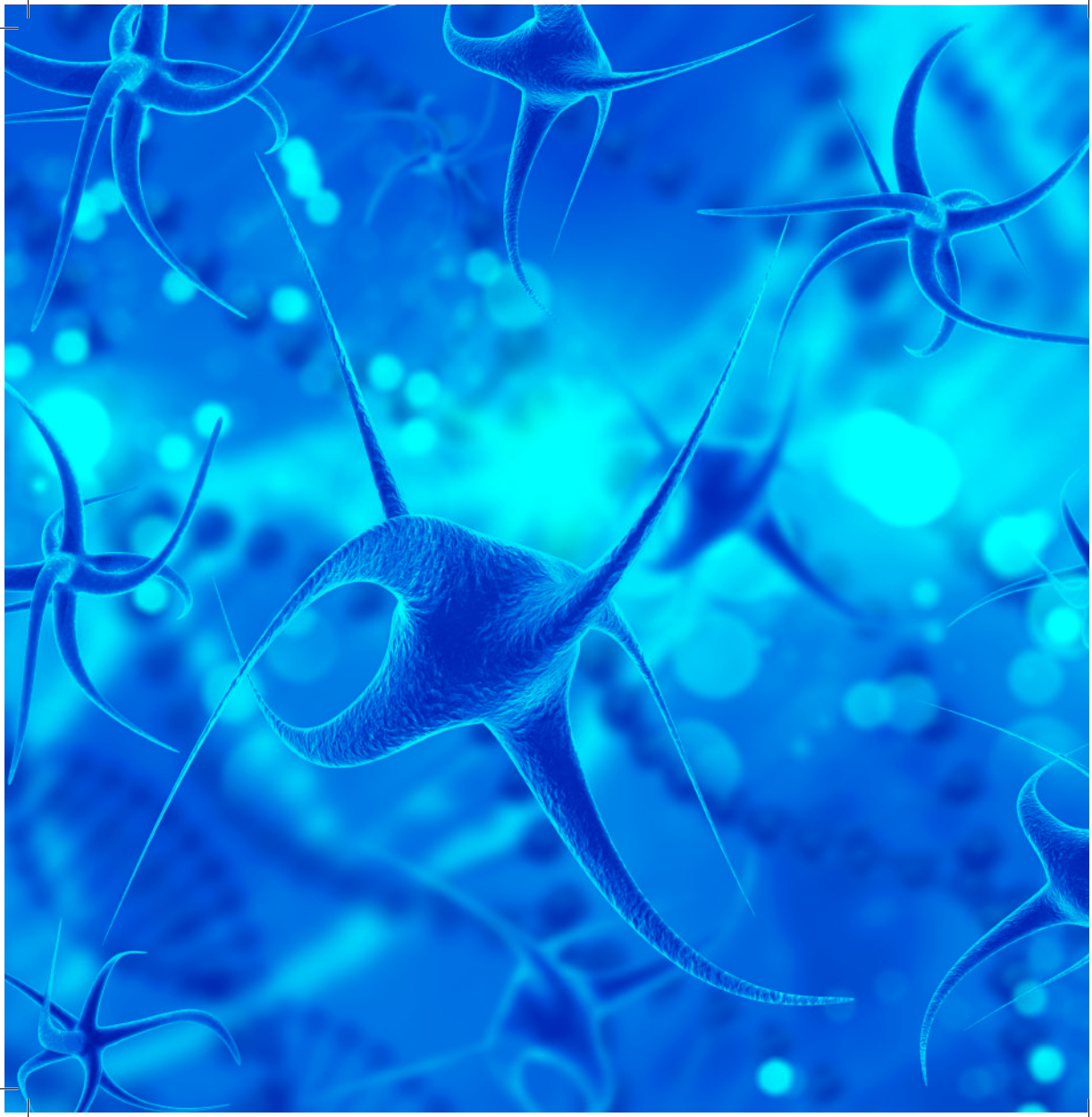


GUIDEBOOK FOR MEDICAL OFFICERS

Diagnosis and Management of Outbreak Prone Diseases



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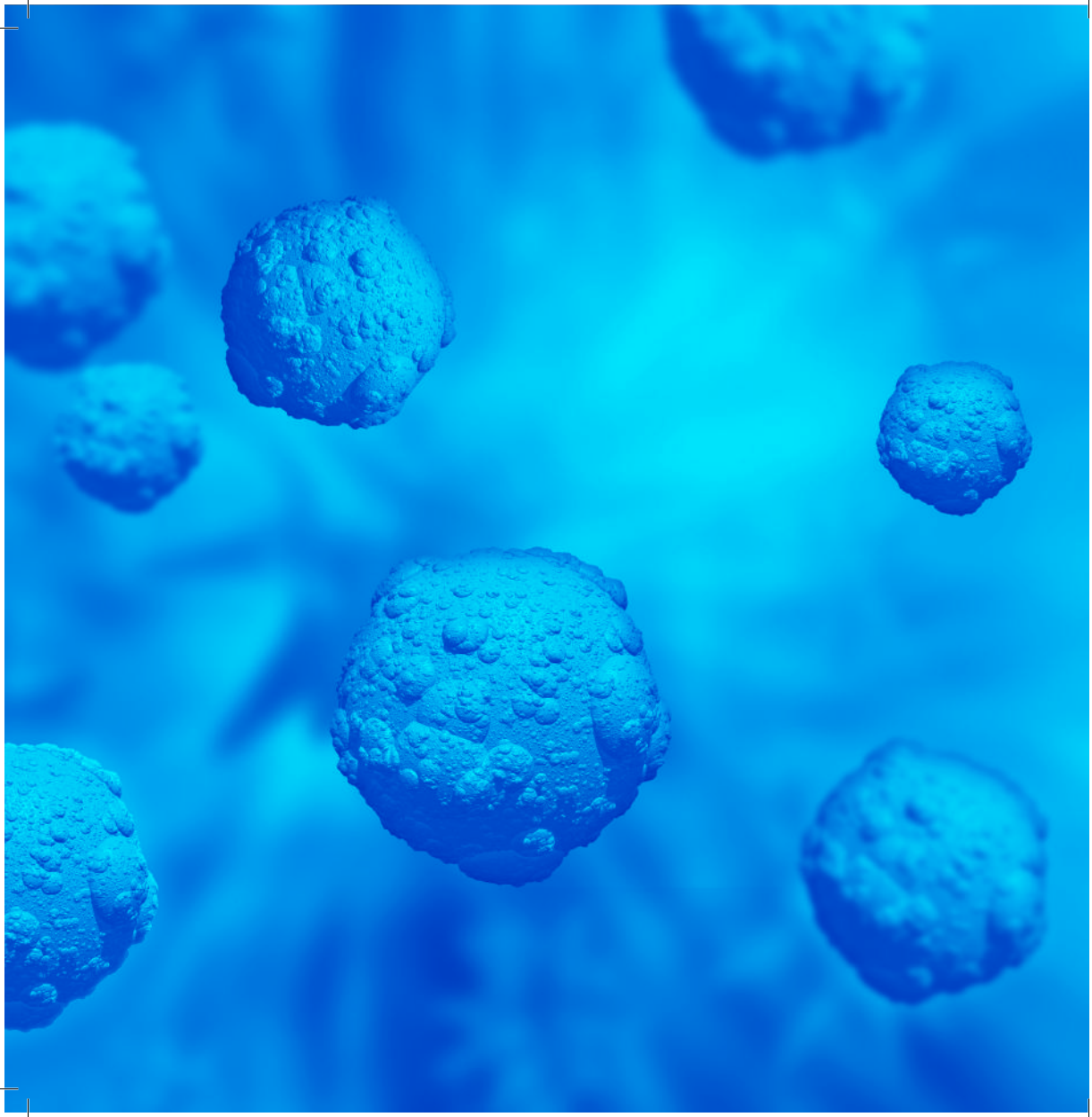

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DR. MANSUKH MANDAVIYA

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

मंत्री
स्वास्थ्य एवं परिवार कल्याण
व रसायन एवं उर्वरक
भारत सरकार
Minister
Health & Family Welfare
and Chemicals & Fertilizers
Government of India

Message

It is with great pleasure that I extend my sincere greetings to all recipients of guidebook tailored for Medical Officers, focusing on the outbreak-prone diseases in the Indian context. In our ongoing commitment to the health and well-being of our nation, the Ministry of Health and Family Welfare is proud to present this comprehensive resource.

The PM-Ayushman Bharat Health Infrastructure Mission (PM-ABHIM), led by Hon'ble Prime Minister Shri Narendra Modi Ji, is pivotal in establishing a nationwide health infrastructure, prioritizing quality healthcare for vulnerable citizens. Within the Public Health Systems for Pandemic Preparedness Programme (PHSPP) under PM-ABHIM, training of public health workers is crucial. Their proficiency is vital in strengthening India's surveillance, ensuring prompt outbreak detection, and averting novel pathogens.

This guidebook, is an invaluable resource, fostering an enhanced understanding of prevalent outbreak-prone diseases and arming professionals with the requisite knowledge and skills for efficacious responses. It is our steadfast belief that a prepared and well-informed healthcare workforce forms the bedrock of a resilient health system.

I extend my commendations to National Centre for Disease Control (NCDC), Integrated Disease Surveillance Programme (IDSP) and all those involved in the assiduous development of this guidebook. I urge Medical Officers to leverage this scholarly resource to augment their capabilities and actively contribute to our collective endeavor of safeguarding the health of our citizens.

In unison, let us persevere in our pursuit of a healthier and more resilient India.

(Dr. Mansukh Mandaviya)

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सत्यमेव जयते

राज्य मंत्री
स्वास्थ्य एवं परिवार कल्याण
भारत सरकार
MINISTER OF STATE FOR
HEALTH & FAMILY WELFARE
GOVERNMENT OF INDIA

Message

In the diverse tapestry of our nation, the field of healthcare is both dynamic and challenging. As we confront various health threats, preparedness and knowledge become paramount. This guidebook, meticulously curated for medical officers, is a testament to our collective commitment to equipping our healthcare professionals with the tools they need to safeguard the health of our citizens.

India, with its rich cultural diversity and demographic complexity, demands a nuanced and comprehensive approach to public health. Over the years, our nation has faced various health challenges, and the ongoing efforts of the Ministry of Health and Family Welfare are aimed at fortifying our healthcare system against the evolving landscape of infectious diseases.

I am particularly proud to note the significant strides made under the visionary leadership of Prime Minister Narendra Modi, especially through initiatives like the PM-Ayushman Bharat Health Infrastructure Mission. This transformative mission is not just a blueprint for healthcare; it is a pledge to ensure accessible and quality healthcare reaches every corner of our nation.

In the context of outbreak-prone diseases, the guidebook emphasizes the importance of a well-prepared healthcare workforce. It is through their dedication and expertise that we fortify our surveillance systems, detect potential outbreaks promptly, and ensure a swift and effective response.

I extend my heartfelt appreciation to all those who have contributed to the development of this guidebook. Your commitment to excellence in healthcare is commendable, and this guidebook stands as a valuable resource for our medical officers in their pursuit of knowledge and skill enhancement.

To the medical officers who will utilize this guidebook in the noble service of our nation, I encourage you to delve into its contents with the utmost dedication. Your role is pivotal in our collective efforts to create a healthier and more resilient India.

Wishing you success in your endeavors and looking forward to continued advancements in the field of public health.

(Prof. S.P. Singh Baghel)

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Dr. Bharati Pravin Pawar

सत्यमेव जयते

स्वास्थ्य एवं परिवार कल्याण राज्य मंत्री
भारत सरकार

MINISTER OF STATE FOR
HEALTH & FAMILY WELFARE
GOVERNMENT OF INDIA

MESSAGE

National Centre of Disease Control (NCDC) and Integrated Disease Surveillance Programme (IDSP) has been instrumental in facilitating the early detection of outbreaks, ensuring a prompt and coordinated response, and providing healthcare professionals with the necessary tools and resources to combat infectious diseases effectively.

The medical officers are the first responders, the sentinels on the front lines, and their ability to identify unusual syndromes, early warning signals of impending outbreaks is of paramount importance. In order to better equip them with the knowledge, guidelines, and strategies needed to effectively respond to outbreaks, this guidebook has been conceptualized and made available. Medical officers will find a comprehensive resource that delves into the diagnosis, treatment, and preventive measures for outbreak-prone diseases. It underscores the importance of early detection, rapid response, and efficient management—core elements in the fight against infectious threats.

It is pertinent to emphasize that the Government of India, under the dynamic leadership of Hon'ble Prime Minister Shri Narendra Modi ji and visionary guidance of Hon'ble Cabinet Minister for Health & Family Welfare Dr. Mansukh Mandaviya ji, is taking new initiatives to meet all the health needs of the people of India and is making all efforts to strengthen public health facilities across the States/UTs.

I commend this guidebook to all medical officers and healthcare professionals. By internalizing its contents and implementing its recommendations, you are not only enhancing your own ability to manage and mitigate the impact of outbreak-prone diseases but also contributing to the broader landscape of public health in our diverse and dynamic nation. I congratulate and thank all the experts and stakeholders involved from NCDC and USAID-NISHTHA/Jhpiego in developing this valuable resource

Together, we stand resilient, prepared, and equipped to face the challenges of infectious diseases, and strive to create a healthier and safer India.

सर्वे भवन्तु सुखिनः। सर्वे सन्तु निरामयाः।

(Dr. Bharati Pravin Pawar)

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Secretary

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

भारत सरकार
स्वास्थ्य एवं परिवार कल्याण विभाग
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
Government of India
Department of Health and Family Welfare
Ministry of Health and Family Welfare

MESSAGE

In today's increasingly interconnected world, the challenge of infectious diseases remains a constant threat to public health. The world's complex web of travel, trade and migration has in recent times, contributed to the rapid spread of infectious diseases. The very nature of outbreaks is often unpredictable, necessitating a proactive and well-informed approach. During India's G20 summit, pandemic preparedness took center stage as a critical global priority and the imperative need for comprehensive strategies to prevent, detect, and respond to future pandemics effectively was discussed.

Ministry of Health & Family Welfare (MoHFW), Government of India is committed to strengthen the disease surveillance in the country for epidemic prone diseases through its Integrated Disease Surveillance Programme (IDSP), National Centre of Disease Control (NCDC). Since 2004, IDSP has been playing a crucial role in epidemic preparedness, helping India to respond swiftly to health crises, as was evident during the COVID-19 pandemic. An important component in this regard is building the capacity of the workforce in identifying and responding to diseases under surveillance.

Medical Officers are often entrusted with the vital task of early detection, diagnosis, and the management of outbreak-prone diseases. Their dedication and expertise are central to preventing the spread of infectious diseases and ultimately, saving lives. This guidebook is a comprehensive and indispensable resource crafted specifically for medical officers and equips them with the tools needed to stay ahead in the ever-evolving landscape of infectious diseases.

I would recommend this guidebook to all medical officers and healthcare professionals entrusted with the sacred duty of protecting the health and well-being of their communities. By absorbing its contents and putting its recommendations into practice, you are not only safeguarding your communities but also contributing to a safer, healthier world for all.

I congratulate IDSP, NCDC and all the experts and stakeholders who have contributed to the creation of this guidebook.

Sudhansh Pant

28th November, 2023

(Sudhansh Pant)

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Government of India
Ministry of Health & Family Welfare
Directorate General of Health Services

MESSAGE

The 21st century has ushered in new challenges in the realm of public health. New pathogens, climate change, antimicrobial resistance, and unforeseen consequences of globalization have all contributed to a dynamic and complex landscape of infectious as well as non-communicable diseases. National Centre for Disease Control (NCDC) has always been in the forefront in India's effort to respond to emerging and reemerging communicable diseases. Its dedication to disease surveillance, epidemiology, research, and outbreak response underscores its commitment to safeguarding health and well-being of the Indian population.

Mission of Integrated Disease Surveillance Programme (IDSP) has been to strengthen disease surveillance across the country by establishing a decentralized State based surveillance system for epidemic prone diseases to detect early warning signals, so that timely and effective public health measures can be initiated in response to health challenges in the country at Districts, State and National level. For this, IDSP strongly believes that creating an enabling environment for the medical officers, (who are often the first ones to be contacted by the community for their symptoms) is of paramount importance. Realizing the crucial role, competent and well-prepared medical officers play in preventing, detecting and responding to infectious disease threats, a guidebook has been conceptualized and prepared for launch.

In this guidebook, one can find a treasure of knowledge that will assist the Medical Officer in the identification, diagnosis, treatment and public health action to be undertaken for common outbreak-prone diseases. These resources have been designed to be user-friendly and practical, making them an invaluable assets for medical officers operating in the field. The contents of this guidebook could mean the difference between a well-managed outbreak and a potential catastrophe.

I congratulate IDSP, NCDC and their collaborating partners for developing this invaluable document.

(Atul Goel)

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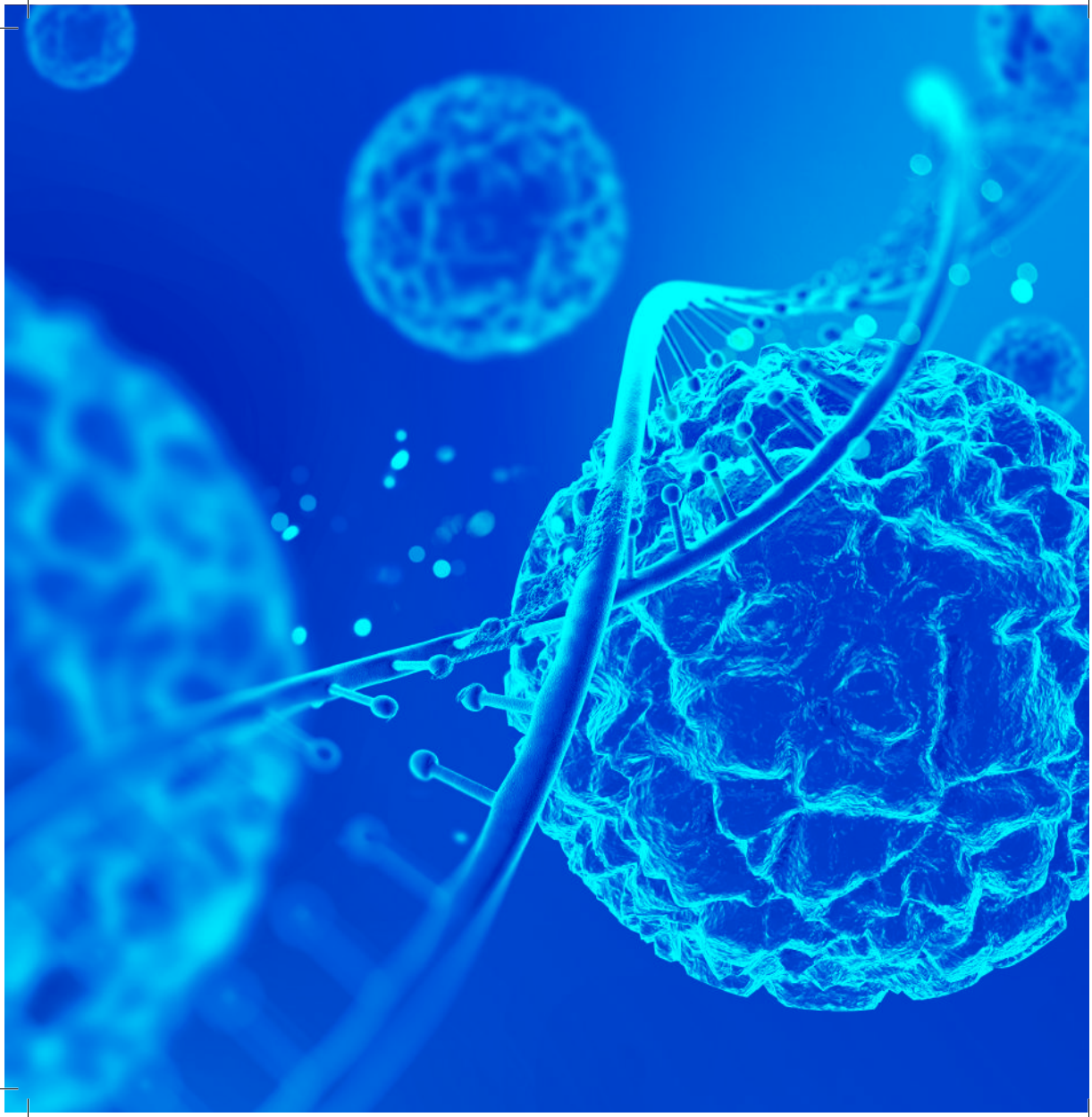

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अपर सचिव
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GOVERNMENT OF INDIA
MINISTRY OF HEALTH & FAMILY WELFARE
NIRMAN BHAWAN, NEW DELHI - 110011

MESSAGE

In the annals of human history, there has never been a more poignant reminder of our shared vulnerability and the critical role that healthcare professionals play in safeguarding our well-being than the emergence of infectious diseases. These invisible adversaries, from the notorious pandemics of the past to the relentless march of emerging pathogens, have tested the mettle of our healthcare systems and the dedication of our medical officers. It is in the crucible of these challenges that the importance of being well-prepared, vigilant, and knowledgeable becomes glaringly evident.

This guidebook, meticulously crafted for medical officers, is a beacon of knowledge and wisdom in the realm of diagnosing and managing outbreak-prone diseases. Its genesis lies in the collective experiences, expertise, and insights of healthcare professionals, epidemiologists, and researchers who have dedicated their lives to understanding and combating infectious diseases.

The world has witnessed seismic changes in the healthcare landscape, driven by globalization, environmental shifts, and the emergence of new diseases. Infectious diseases, once believed to be under control, have resurged with a vengeance, and the threats are relentless. As we navigate this complex terrain, the need for medical officers who are well-prepared and well-informed has never been more critical.

I would congratulate all the experts and stakeholders for bringing out this invaluable resource which would empower medical officers to correctly identify, manage and contain outbreak-prone diseases with knowledge, confidence, and preparedness, enabling them to improve public health in their communities.

Deepti Gaur

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Integrated Disease Surveillance Programme

Joint Director
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National Centre for Disease Control

Message

Despite the advances in detection & control measures, outbreak prone communicable diseases continue to pose a challenge to the public health systems around the World. These conditions include emerging and re-emerging diseases and have a potential to threaten public health security and social and economic gains. In the recent past, India has witnessed a marked increase in the number of outbreaks and pandemics caused by emerging and re-emerging diseases, such as chikungunya, cholera, dengue, H5N1 influenza, H1N1 influenza, Nipah and SARS CoV-2, among others. Early detection, reporting and timely intervention remain the time-proven instruments in minimizing the adverse impact of these diseases.

Integrated Disease Surveillance Programme (IDSP) is mandated to strengthen/maintain decentralized laboratory-based IT enabled disease surveillance system for epidemic prone diseases to monitor disease trends and to detect and respond to outbreaks in early rising phase through trained Rapid Response Team. Under IDSP data is collected on epidemic prone diseases on a near real time basis in the Integrated Health Information Platform (IHIP) portal and is being reported by Health Workers, Clinicians and Laboratory staff. Hence, it is of paramount importance that the clinicians are able to identify the signs and symptoms of the diseases being reported in IDSP- IHIP and are also trained on their effective treatment and prompt public health action in case of an outbreak.

Medical officers play a pivotal role in identifying outbreak-prone diseases as they stand on the front lines of public health defense. Their close interactions with patients, keen clinical observations, and astute diagnostic skills are instrumental in recognizing the early signs and symptoms of potential outbreaks. Their vigilance, coupled with a commitment to public health surveillance, forms a crucial cornerstone in our collective efforts to safeguard communities from the impact of infectious diseases.

Aligned with our commitment to build the capacity of the health workforce to prevent, detect and respond to infectious disease threats, IDSP has collaborated with USAID-NISHTHA/ Jhpiego to conceptualize and develop a guidebook which will serve as a ready reckoner for the medical officers and aid in their daily practice as well as during field investigations in case of outbreak response. Drafted by eminent academicians, public health experts and medical epidemiologist encapsulating the essential facets of epidemiology, diagnosis, treatment, and public health action related to common outbreak-prone diseases in India, this guide would serve as a valuable resource for the users.

I recommend this guidebook for all medical officers and healthcare professionals involved in outbreak management and would like to thank all the contributors who had come forward to make this guidebook a success.

"Early detection is the linchpin of our defense against infectious disease outbreaks"

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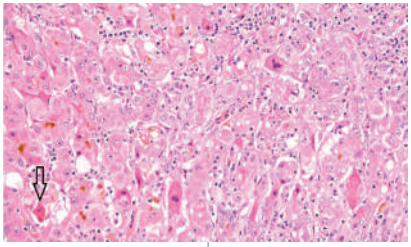
Acute Viral Hepatitis (Hepatitis A and Hepatitis E)



H&E stain showing acute hepatitis with lobular disarray and associated lymphocytic inflammation, acidophil body formation (arrow) and bilirubinostasis.

Acute Viral Hepatitis is a systemic infection affecting the liver. Almost all cases of acute viral Hepatitis are caused by one of five viral agents: Hepatitis A (HAV), Hepatitis B (HBV), Hepatitis C (HCV), the HBV-associated delta agent or Hepatitis D Virus (HDV) and Hepatitis E (HEV). All these human hepatitis viruses are RNA viruses, except for hepatitis B, which is a DNA virus but replicates like a retrovirus. While hepatitis A and E are often the cause for sporadic or outbreaks of hepatitis, hepatitis B and C can either clear spontaneously or can lead to chronic infection.

Mode of Transmission

Hepatitis A: HAV is a non-enveloped RNA virus belonging to the picornavirus family, with four genotypes belonging to one serotype. This agent is transmitted almost exclusively by the fecal-oral route. It is an outbreak prone disease with an incubation period of around four weeks. Person-to-person transmission of HAV is enhanced by poor personal hygiene and overcrowding. Excretion in the stool occurs after seven-14 days of onset of the clinical illness and is diagnostic of an acute HAV infection. No carrier state has been identified.

Hepatitis E: HEV is a non-enveloped single stranded RNA virus belonging to Hepevirus. This agent is transmitted almost exclusively by the fecal oral route. It is an outbreak prone disease with an incubation period of around two-ten weeks.

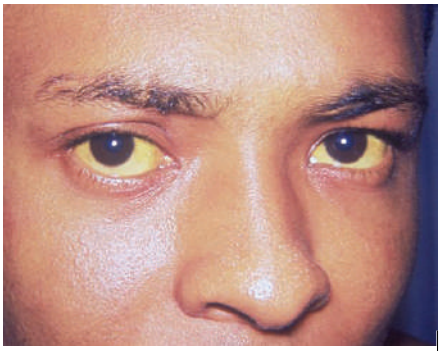
Who is at risk of infection?

- **Hepatitis A: Elderly with presence of underlying debilitating disease.**
- **Hepatitis E: Pregnant women with Pre-existing liver diseases Immunosuppression.**

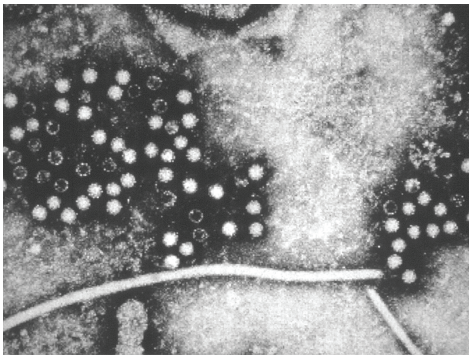
Complications

Hepatitis A: The case fatality is extremely low (~0.1%) but increases in advanced age and in the presence of underlying debilitating diseases.

Hepatitis E: Acute liver failure may be seen in a small proportion (0.4-5%) usually higher in pregnant women, normally within a week of onset of symptoms. Persons with



The viral disease Hepatitis A is manifested here as icterus, or jaundice of the conjunctivae and facial skin.



Top: Electron micrograph of HEV. Formerly a member of the en:Caliciviridae family, HEV are now classified as en:Hepeviridae.

pre-existing liver disease and immunosuppression are also at a higher risk for severe diseases following HEV infection.

Signs and Symptoms

Hepatitis A: The incubation period for HAV ranges from 15-45 days. The prodromal symptoms of Aacute Viral Hepatitis are systemic and quite variable. Constitutional symptoms of low-grade fever, anorexia, nausea and vomiting, fatigue, malaise, arthralgias, myalgias, headache, photophobia, pharyngitis, cough and coryza may precede onset of jaundice by one-two weeks. Dark urine and clay colored stools may be noticed by the patient one-five days before the onset of clinical jaundice. With the onset of clinical jaundice, the constitutional prodromal symptoms usually diminish. The liver becomes enlarged and tender and may be associated with right upper quadrant pain and discomfort. During recovery phase the constitutional symptoms disappear, but usually some liver enlargement and abnormalities in liver biochemical tests are still evident.

Hepatitis E: The illness usually begins after an incubation period of 14-70 days as an acute viral syndrome with mild fever, marked loss of appetite, aversion to food, upper abdominal discomfort, nausea and/vomiting. Within a few days after onset of these non-specific symptoms, onset of jaundice is visible and non-specific symptoms decline. Jaundice usually persists for one-six weeks and then gradually resolves. In children, most HEV infections occur without any symptom or as a mild illness without jaundice. In contrast, in adults, acute Hepatitis E may have a prolonged cholestatic phase with significant itching.

Clinical Characteristic of Acute Hepatitis A and Hepatitis E

Characteristic	HAV	HEV
Incubation Period (Median no. of days)	30	40
Dose dependent severity	No	Yes
Mortality	0.1-2.1%	0.2-4%
Mortality in Pregnancy	No difference	Upto 25%
Age group	Adolescent, young adults	Adolescent, young adults & older adults
Gender	No difference	Males are more commonly affected

Public Health Measures to be Taken

- **Identify and maintain a line list of cases.**
- **Health education activities to promote safe water drinking practices.**
- **Regular water quality checks in the community.**
- **Conduct Sanitation surveys in the community.**

Diagnosis

Presumptive Case Definition

Any person having clinical evidence of jaundice with
- Signs and symptoms of acute Hepatitis like malaise, fever, vomiting, AND
- Bio-chemical criteria of o serum bilirubin of greater than 2.5 mg/dl, AND
- More than tenfold rise in ALT/SGPT.

Confirmed Case Definition

Hepatitis A: A case compatible with the clinical description of acute Hepatitis with demonstration of anti-HAV IgM in serum sample.

Hepatitis E: A case compatible with the clinical description of acute Hepatitis with demonstration of anti-HEV IgM in serum sample.

Treatment

Hepatitis A: There is no role of antiviral drugs for treatment of HAV infection. Healthy people with Hepatitis A recovers completely with no clinical sequelae.

Hepatitis E: There is no specific treatment capable of altering the course of acute Hepatitis E. As the disease is usually self-limiting, hospitalization is generally not required. It is required for people with fulminant Hepatitis and symptomatic pregnant women Immunosuppressed people with chronic Hepatitis E benefit from specific treatment using ribavirin, an antiviral drug. In some specific situations, interferon has also been used successfully.

Prevention

Improved sanitation, food safety and immunization are the most effective ways to combat Hepatitis A and E.

The spread can be reduced by:
- Adequate supplies of safe drinking water.
- Proper disposal of sewage within communities.
- Personal hygiene practices such as regular handwashing before meals and after going to the bathroom.

Laboratory Investigation for Confirmation

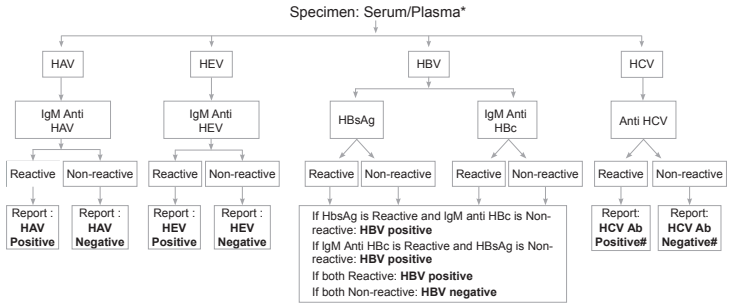
- Cases of Hepatitis E and A are not clinically distinguishable from other types of acute viral Hepatitis. Diagnosis is strongly suspected in appropriate epidemiologic

settings e.g. occurrence of several cases in localities in known disease-endemic areas, in settings with risk of water contamination.

- The serum bilirubin levels are above 2.5 mg/dL and serum ALT is more than ten times the upper limit of normal.

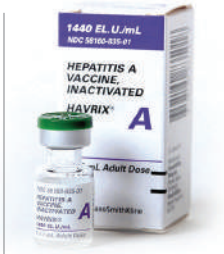
Type of Specimen	Type of Test	Volume to be collected	Storage & Transport
Blood	Serological tests	3-5 ml of venous blood	• Serum should be removed from clotted blood within four hours of collection and stored at -20°-70° C • Serum samples can be kept at 4°-8° C for maximum of seven days • If serum samples are to be stored for longer duration, it should be frozen at -20° C or lower and transported to the testing lab on frozen ice-packs
Sewage and Water samples in outbreak investigations	RT-PCR		Transported at room temperature

Testing algorithm for the diagnosis of viral hepatitis in jaundiced patients



* Serum samples to be used for serological and biochemical testing, to be aliquoted and stored at -20°C for retesting for quality purposes, dispute etc.

All HCV antibody (Ab) positive to be referred to treatment centre. Plasma samples to be collected and aliquoted in 3 sterile cryo vials. One vial to be used for quantitative hepatitis C RNA estimation and two archived at -80°C for quality assurance.



HAVRIX is a vaccine used to help prevent Hepatitis A infection.

REFERENCES

1. https://www.cdc.gov/hepatitis/abc/index.htm

2. National Guidelines for Diagnosis & Management of Viral Hepatitis, MoHFW, 2018

3. Glynn W. Webb, Sophie Kelly, Harry R. Dalton, Hepatitis A and Hepatitis E: Clinical and Epidemiological Features, Diagnosis, Treatment, and Prevention, Clinical Microbiology Newsletter, Volume 42, Issue 21, 2020, Pages 171-179, ISSN 0196- 4399 https://doi.org/10.1016/j.clinmicnews.2020.10.001

Anthrax

Color-enhanced scanning electron micrograph shows splenic tissue from a monkey with inhalational anthrax; featured are rod-shaped bacilli (yellow) and an erythrocyte (red).

Anthrax is a serious infectious disease caused by gram-positive, rod-shaped bacteria known as Bacillus anthracis. Anthrax spores are found naturally in soil and infect both wild and domestic animals such as cattle, sheep, goats, antelope, and deer.

Mode of Transmission

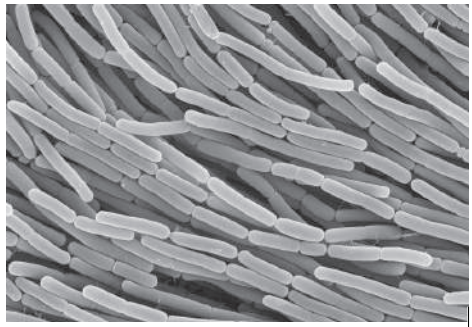
- **Spread of disease in animals:** Animals can get infected when they breathe in or ingest spores in contaminated soil, plants or water.
- **Spread of disease in humans:** Person to person transmission is very rare. People normally get infected by anthrax bacillus by:
  - Inhaling spores
  - Eating food or drinking water that is contaminated with spores
  - Getting spores in the body through a cut or scrape in the skin

Types of Anthrax

- **Cutaneous:** Entry of anthrax spores into the skin through a cut or scrape, can lead to cutaneous anthrax. The incubation period for cutaneous anthrax is one-seven days. Skin infection begins as a painless, pruritic papule that resembles an insect bite but within one-two days develops into a vesicle (usually one-three cm in diameter) and then a painless ulcer with a characteristic black necrotic area in the center surrounded by erythema and edema. Systemic symptoms are mild and may include malaise and low-grade fever. There may be regional lymphangitis and lymphadenopathy. Occasionally more severe form of cutaneous anthrax may occur with extensive local oedema, induration and toxaemia.

- **Gastrointestinal Anthrax:** Gastrointestinal anthrax develops when a person eats raw or undercooked meat from an animal infected with anthrax. There are two clinical forms of gastrointestinal anthrax –
  - **Intestinal Anthrax**
  - **Oropharyngeal Anthrax**

- **Pulmonary (inhalation):** Inhalation anthrax is considered to be the deadliest form of anthrax. Infection usually develops within a week after



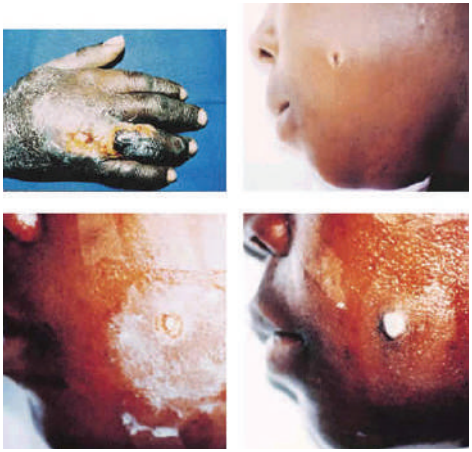
Bacillus anthracis, colony, vegetative Bacteria (predominantly in chains) without visible formation of spores. Sscanning electron microscope, SEM. Bar = 3 µm.

Who is at risk of infection?

- **Farmers**
- **Veterinarians**
- **Livestock handlers**
- **Wool sorters**
- **Laboratory staff**

exposure, but it can take up to two months. Brief prodrome resembling acute viral respiratory illness, followed by rapid onset of hypoxia, dyspnea and high temperature, with X-ray evidence of mediastinal widening. Without treatment, only about 10-15% of patients with inhalation anthrax survive.

- **Injection:** This form of anthrax was recently identified in heroin-injecting drug users in northern Europe, with symptoms similar to cutaneous anthrax.



Cutaneous Anthrax—vesicle development, day 10.

Signs and Symptoms

Cutaneous Anthrax	Inhalation Anthrax	Gastrointestinal Anthrax	Injection Anthrax
• A group of small blisters or bumps that may itch • Swelling around the sore • A painless skin sore (ulcer) with a black center that appears after the small blisters or bumps. Most often the sore will be on the face, neck, arms, or hands	• Fever and chills • Chest discomfort • Shortness of breath • Confusion or dizziness • Cough • Nausea, vomiting, or stomach pains • Headache • Sweats (often drenching) • Extreme tiredness • Body aches	• Fever and chills • Swelling of neck or neck glands • Sore throat • Painful swallowing • Hoarseness • Nausea and vomiting, especially bloody vomiting • Diarrhea or bloody diarrhea • Headache • Flushing (red face) and red eyes • Stomach pain • Fainting • Massive ascites • Toxaemia	• Fever and chills • A group of small blisters or bumps that may itch, appearing where the drug was injected • A painless skin sore with a black center that appears after the blisters or bumps • Swelling around the sore • Abscesses deep under the skin or in the muscle where the drug was injected

Diagnosis

Presumptive Case Definition

A case that is compatible with the clinical description AND has an epidemiological link to confirmed or suspected animal cases (bleeding from natural orifices or bloated carcass) OR exposure to contaminated animal products with or without Gram positive spore forming bacilli (1.5 to 3-4µm in size), arranged end to end in chains (bamboo stick appearance).

Laboratory Investigation for Confirmation

A presumptive case with isolation and identification of B. anthracis from relevant samples and identified by colony morphology, microscopy and biochemical test. Gamma phage lysis OR validated PCR (toxin and capsule genes) may be used for final confirmation (validated PCR on direct clinical sample is also acceptable).

Treatment

Category	Antibiotic	Duration
Naturally occurring anthrax	**First choice*:** • Procaine Penicillin G, 0.6-1.2 M units IM q 12-24 h • Penicillin G, sodium or potassium 4 M units IV q 4-6 h • Amoxicillin 500 mg PO q 6-8 h **Alternative*:** • Doxycycline 100 mg IV/PO q 12 h • Ciprofloxacin 200-400 mg IV q12 h, followed by 500-750 mg PO q12 h	3-5 days (up to 3-7 days) for cutaneous anthrax without complications; 10-14 days for systemic anthrax†
Intravenous/injectional anthrax	Combination of antibiotics, plus surgical debridement, followed by reconstructive surgery if required	10-14 days, with up to 60 days for intranasal drug users
Biological weapon or bio-terrorism-related anthrax	• Ciprofloxacin 200-400 mg IV q 12 h, followed by 500-750 mg PO q 12 h • Doxycycline 100 mg IV/PO q12 h	42-60 days

* For mild cutaneous anthrax, antibiotics may be administered orally.
For severe cutaneous or systemic anthrax, intravenous antibiotics must be administered initially, therapy may be changed to oral once symptoms improve.

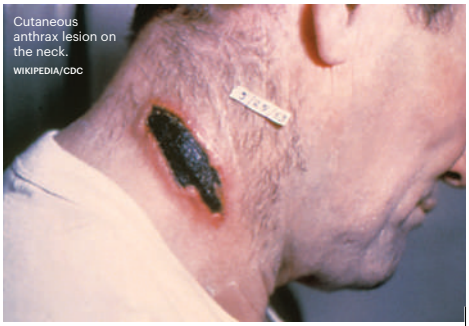
† In case of disseminated infection, the antibiotic selected initially must be combined with one or two of the following; Penicillin, ampicillin, ciprofloxacin, imipenem, meropenem, vancomycin, rifampicin, clindamycin, linezolid, streptomycin, or another aminoglycoside
If the patient presents with meningitis, a combination of atleast two antibiotics with the ability to penetrate cerebrospinal fluid must be administered. In addition, an antitoxin may also be administered.

Public Health Measures to be Taken

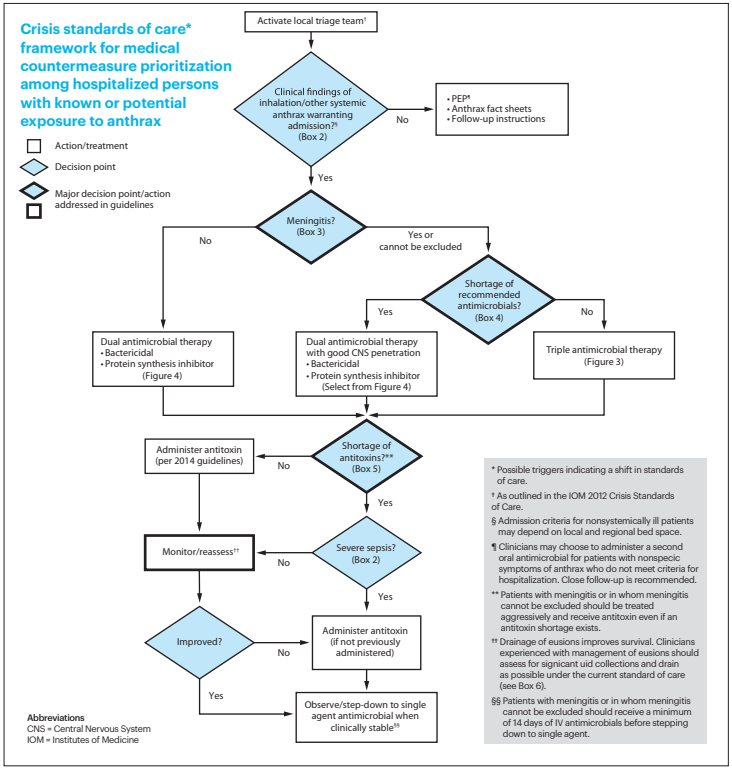
- **Contact tracing of cases.**
- **Vaccination as per GoI guidelines.**
- **Behavior change communication to avoid high risk activities.**
- **Immunize health personnel in hospitals.**

Prevention

Anthrax Vaccine Adsorbed (AVA) approved by FDA for use in routine occupational use (before possible exposure) and post-event emergency use (after possible exposure).



Cutaneous anthrax lesion on the neck.
WIKIPEDIA/CDC



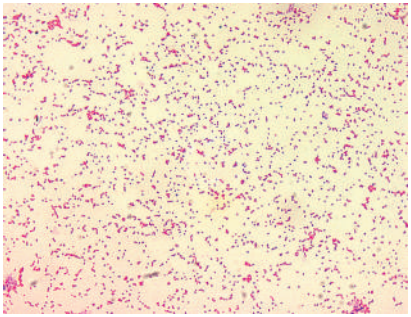
Laboratory Investigation for Confirmation

Type of specimen	Test	Volume	Mode of Collection	Transportation
Blood/skin lesions/respiratory secretions (depending on type of illness)	Gram stain culture and sensitivity	NA	Clean sterile container	In cold chain (2-8°C)
	ELISA			
	PCR			

REFERENCES

1. Home: Integrated Disease Surveillance Programme(IDSP)
2. https://ncdc.gov.in/
3. https://www.cdc.gov/anthrax/pdf/evergreen-pdfs/anthrax-evergreen-content-english.pdf
4. Bower WA, Hendricks K, Pillai S, Guarnizo J, Meaney-Delman D. Clinical framework and medical countermeasure use during an anthrax mass-casualty incident: CDC recommendations. Morbidity and Mortality Weekly Report: Recommendations and Reports. 2015 Dec 4;64(4):1-22
5. Savransky V, Ionin B, Reece J. Current status and trends in prophylaxis and management of anthrax disease. Pathogens. 2020 May;9(5):370

Brucellosis



Gram stain of Brucella melitensis.

Brucellosis is a zoonotic infection caused by the bacterial genus Brucella, which mainly infect cattle, swine, goats, sheep and dogs. Humans generally acquire the disease through direct contact with infected animals, by eating or drinking contaminated animal products or by inhaling airborne agents.

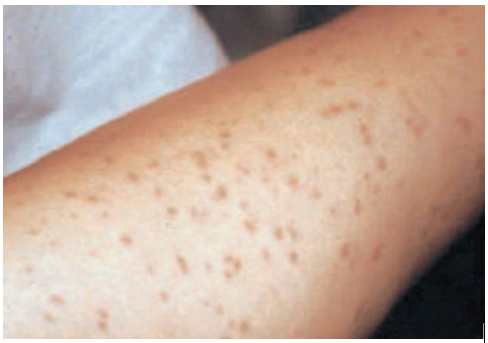
Brucella organisms, which are small aerobic intracellular coccobacilli, localize in the reproductive organs of host animals, causing abortions and sterility. They are shed in large numbers in the animal's urine, milk, placental fluid, and other fluids. To date, 8 species have been identified, named primarily for the source animal or features of infection.

Of these, the following four have moderate-to-significant human pathogenicity:
- Brucella melitensis (from sheep; highest pathogenicity)
- Brucella suis (from pigs; high pathogenicity)
- Brucella abortus (from cattle; moderate pathogenicity)
- Brucella canis (from dogs; moderate pathogenicity)

Mode of Transmission

- Consumption of undercooked meat or unpasteurized/raw dairy products
- Inhalation of bacteria or entry of bacteria through cuts/ wounds on skin/mucous membranes of people working in laboratories, slaughterhouses and meat packing factories.

The incubation period of the disease can be highly variable, ranging from 1 week to 2 months, but usually 2-4 weeks.



These yellowish-tan to reddish brown spots and bumps produce a hive when stroked, indicating systemic mastocytosis.

Who is at risk of infection?

- **Farmers**
- **Butchers**
- **Hunters**
- **Veterinarians**
- **Laboratory personnel**

Signs and Symptoms

- Fever
- Sweats
- Malaise
- Anorexia
- Headache
- Pain in muscles
- Pain in joints and back
- Fatigue

Diagnosis

Presumptive Case Definition

An illness characterized by acute or insidious onset of fever with any of the following:

- Night sweats, arthralgia, headache, fatigue, anorexia, myalgia, weight loss, arthritis/spondylitis, meningitis, or focal organ involvement (endocarditis, orchitis/epididymitis, hepatomegaly, splenomegaly).

AND

Important risk factors to be kept in mind are;

- Slaughterhouse workers • Meat-packing plant employees • Veterinarians • Ingesting undercooked meat • Consumption of unpasteurized/raw dairy products • Assisted animals giving birth.

Laboratory Confirmed Case Definition

A case compatible with the clinical description of brucellosis with at least one of the following:

1. High titre of IgM antibodies in ELISA (evaluated with locally determined cutoff) for single clinical sample*.
2. A four-fold rise in the SAT (total antibodies) between acute and convalescent-phase serum specimens run parallel.
3. Seroconversion on ELISA in paired serology (demonstrating the conversion of IgM to IgG antibodies).

*A single serum sample showing high titres of IgM antibodies may indicate acute infection

These 1-3 tests are the preferred tests as ELISA are widely acceptable.
Other: Isolation and Validated PCR can be done in patients who have not received antibiotic and in early stage of diseases (preferably less than 7 days).

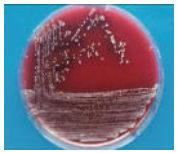
Treatment

Doxycycline 100 mg twice a day for 45 days, plus streptomycin 1 gm daily for 15 days. The main alternative therapy is doxycycline at 100 mg, twice a day for 45 days, plus rifampicin at 15 mg/kg/day (600-900 mg) for 45 days.

Prevention

- Vaccination of cattle, goats and sheep is recommended in enzootic areas with high prevalence rates.
- Pasteurization of milk for consumption
- People who handle animals/animal products such as hunters and butchers should use protective gear such as rubber gloves, goggles, gowns and aprons.

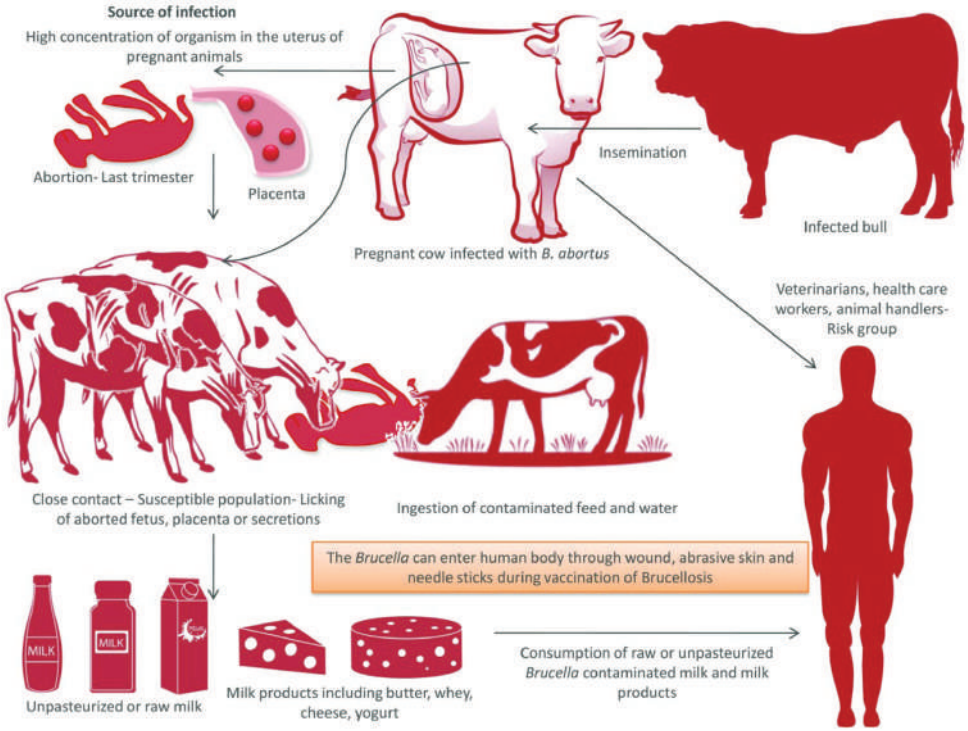
Colony morphology of Brucella melitensis on blood agar.



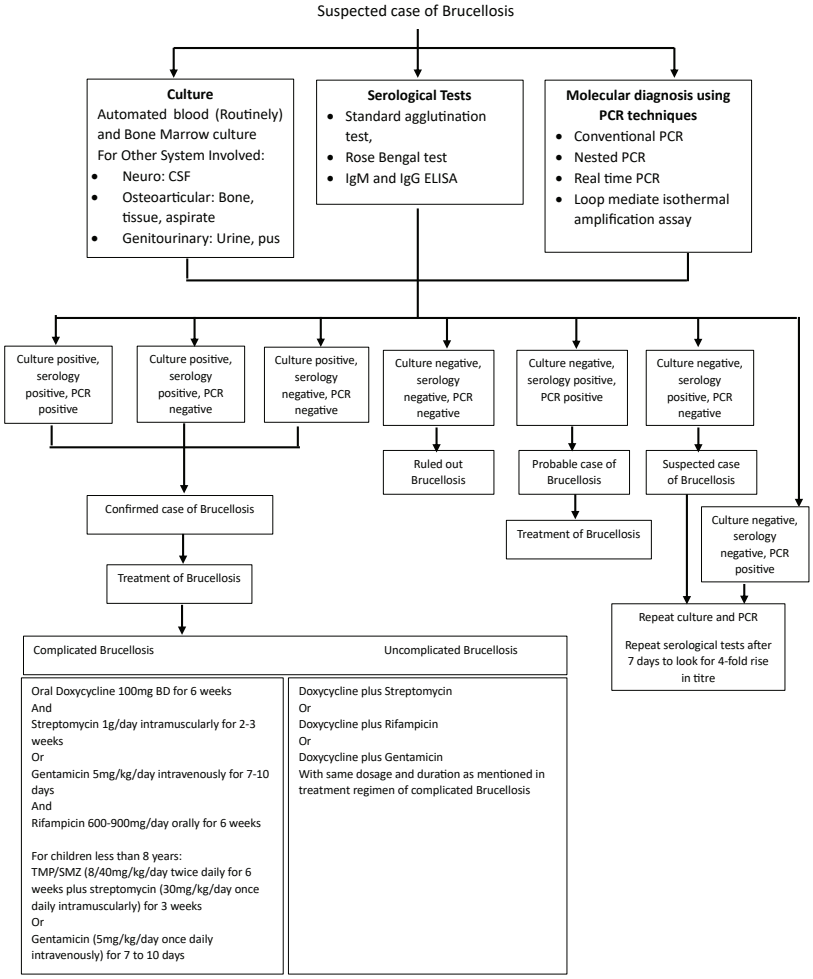
Villager and calf share milk from cow in Rajasthan, India.

REFERENCES

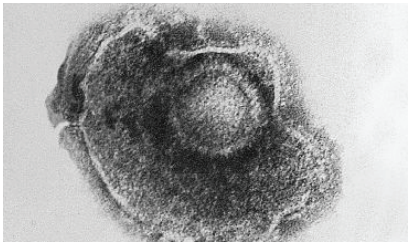
1. Home: Integrated Disease Surveillance Programme(IDSP)
2. https://www.cdc.gov/brucellosis/index.html
3. https://www.who.int/news-room/fact-sheets/detail/brucellosis
4. https://ncdc.gov.in/WriteReadData/l892s/File618.pdf



Transmission of Brucellosis. Pregnant cows usually abort in the last trimester of pregnancy. Aborted fetus, placenta, and secretion from uterus act as the source of infection to other animals. Milk and milk products can act as source of infection to man, if consumed unpasteurized. Infected bulls serve as the lifelong source of infection.


Suspected case of Brucellosis
Culture
Automated blood (Routinely) and Bone Marrow culture
For Other System Involved:
Neuro: CSF
Osteoarticular: Bone, tissue, aspirate
Genitourinary: Urine, pus
Serological Tests
Standard agglutination test,
Rose Bengal test
IgM and IgG ELISA
Molecular diagnosis using PCR techniques
Conventional PCR
Nested PCR
Real time PCR
Loop mediate isothermal amplification assay
Culture positive, serology positive, PCR positive
Culture positive, serology positive, PCR negative
Culture positive, serology negative, PCR negative
Culture negative, serology negative, PCR negative
Culture negative, serology positive, PCR positive
Culture negative, serology positive, PCR negative
Ruled out Brucellosis
Probable case of Brucellosis
Suspected case of Brucellosis
Confirmed case of Brucellosis
Treatment of Brucellosis
Culture negative, serology negative, PCR positive
Repeat culture and PCR
Repeat serological tests after 7 days to look for 4-fold rise in titre
Complicated Brucellosis
Uncomplicated Brucellosis
Oral Doxycycline 100mg BD for 6 weeks
And
Streptomycin 1g/day intramuscularly for 2-3 weeks
Or
Gentamicin 5mg/kg/day intravenously for 7-10 days
And
Rifampicin 600-900mg/day orally for 6 weeks
For children less than 8 years:
TMP/SMZ (8/40mg/kg/day twice daily for 6 weeks plus streptomycin (30mg/kg/day once daily intramuscularly) for 3 weeks
Or
Gentamicin (5mg/kg/day once daily intravenously) for 7 to 10 days
Doxycycline plus Streptomycin
Or
Doxycycline plus Rifampicin
Or
Doxycycline plus Gentamicin
With same dosage and duration as mentioned in treatment regimen of complicated Brucellosis

Chickenpox



Electron micrograph of a Varicella (Chickenpox) Virus. Varicella or Chickenpox.

Chickenpox is a highly contagious disease caused by the varicella-zoster virus (VZV). Only one serotype of VZV is known, and humans are the only reservoir. Following infection, the virus remains latent in neural ganglia and in about 10-20% of cases it is reactivated to cause herpes zoster, or shingles, generally in persons over 50 years of age or immunocompromised individuals.

Mode of Transmission

VZV transmission occurs via droplets, aerosols, or direct contact with respiratory secretions, and almost always produces clinical disease in susceptible individuals. People with shingles can spread VZV to people who have never had chickenpox or never received the chickenpox vaccine. This can happen through direct contact with fluid from shingles rash blisters or through breathing in virus particles that come from the blisters. If they get infected, they will develop chickenpox, not shingles.

Signs and Symptoms

- It takes about 2 weeks (from 10-21 days) after exposure to a person with chickenpox or shingles for someone to develop chickenpox.
- If a vaccinated person gets the disease, they can still spread it to others. For most people, getting chickenpox once provides immunity for life. It is possible to get chickenpox more than once, but this is not common.

Who is at risk of infection?

For most people, getting chickenpox once provides immunity for life. It is possible to get chickenpox more than once, but this is not common. Vaccinated people who get chickenpox may develop lesions that do not crust.

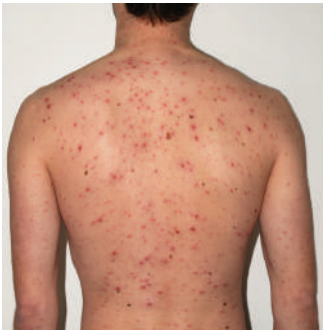
Complications

People who may get a serious case of chickenpox and may be at high risk for complications include:

- Infants
- Adolescents
- Adults
- Pregnant women
- Immuno-compromised
  - People with HIV/AIDS or cancer
  - Patients who have had transplants
  - People on chemotherapy, immunosuppressive medications, or long-term use of steroids

Serious complications from chickenpox include:

- Bacterial infections of the skin and soft tissues in children, including Group A streptococcal infections
- Pneumonia
- Encephalitis
- Cerebellar ataxia
- Hemorrhagic complications
- Sepsis
- Dehydration



The combination of extreme heat and humid conditions are the major reasons for chicken pox.

Diagnosis

Presumptive Case Definition

Acute onset of a generalized maculopapulovesicular rash with:

- Concomitant presence of papules, blisters, pustules or crusts appearing on trunk and face and spreading to extremities, without other apparent cause.

Laboratory Confirmed Case Definition

Presumptive case with

- Detection of VZV DNA (using PCR) OR,
- Direct antigen detection of VZV from an appropriate clinical specimen e.g. direct fluorescent antibody (DFA) OR,
- Isolation using viral culture OR,
- Seroconversion or a significant rise (fourfold or greater) in varicella-zoster IgG titer between acute and convalescent sera by any validated serologic assay.

Treatment

Treatment of varicella with antiviral medication such as acyclovir are recommended only for patients with generalized varicella and persons at high risk for severe varicella.

Prevention

- To prevent spread, persons with varicella should avoid leaving home until their lesions are crusted and dry.
- Vaccinated persons to avoid leaving home until no new lesions appear within 24-hours.
- Post-exposure prophylaxis with immunoglobulin can be considered in non-immune contacts at high risk of severe disease and complications.
- Vaccine is recommended by Indian Association of Pediatrics (IAP). However, it is not available in the public health distribution system.

Outbreak definition

An outbreak of chickenpox is an increase in varicella cases over baseline, tightly clustered in place and time.

Laboratory Investigation for Confirmation

The diagnosis of varicella is usually made clinically by the characteristic clinical presentation of the rash with fever. As per WHO, laboratory confirmation is not routinely recommended as part of a minimum standard surveillance system.

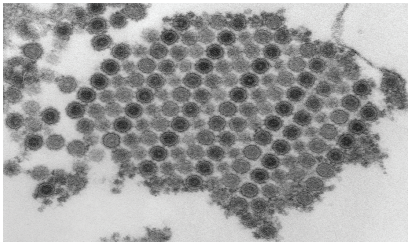
Public Health Measures to be Taken

- **Enhanced case-based surveillance and active case search with Contact Tracing**
- **List of unimmunized/ unvaccinated children in the area**
- **Isolation and symptomatic management of cases.**

REFERENCES

1. https://www.cdc.gov/chickenpox/about/index.html
2. https://www.who.int
3. https://www.nhp.gov.in/disease/skin/chickenpox
4. Vaccine-Preventable Diseases Surveillance Standards, WHO, 2018

Chikungunya



Transmission electron micrograph (TEM) depicting numerous Chikungunya virus particles.

Chikungunya is a viral disease caused by the chikungunya virus (CHIKV) transmitted to humans by bite of infected mosquitoes. Dengue and Zika have similar symptoms to chikungunya, making chikungunya easy to misdiagnose.

Mode of Transmission

Chikungunya virus is transmitted between humans via mosquitoes. When a naïve (uninfected) mosquito feeds upon a viremic person (someone who has the virus circulating in their blood), the mosquito can pick up the virus as it ingests the blood. The virus then undergoes a period of replication in the mosquito, before which time it can then be transmitted back to a new, naïve host, when the mosquito next feeds. The virus again begins to replicate in this newly infected person and amplify to high concentrations. If a mosquito feeds on them during the time they have virus circulating in their blood, the mosquito can pick up the virus, and the transmission cycle begins again. The complete transmission cycle from human to mosquito, and back to humans can occur in well under a week. Once infectious, the mosquito is believed to be capable of transmitting virus for the rest of its life.

Who is at risk of infection?

Everyone living in endemic areas, below mentioned ones:

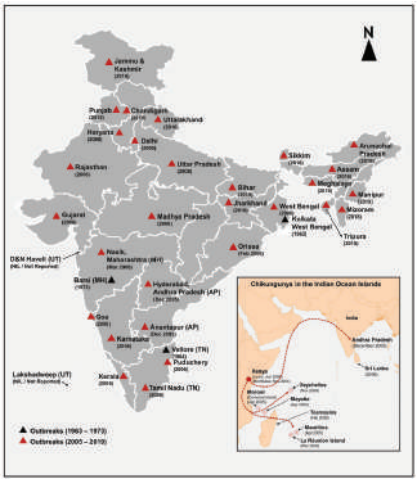
- **Newborns infected around the time of birth**
- **Older adults (≥65 years), and**
- **People with high blood pressure, diabetes, or heart disease**
- **Co-infection with TB, typhoid, Pneumonia, HIV, malaria or dengue.**

Most commonly, the mosquitoes involved in the transmission cycle are Aedes aegypti and Aedes albopictus. Both species can also transmit other mosquito-borne viruses, including dengue and Zika fever viruses.

Signs and Symptoms

- After the bite of an infected mosquito, onset of illness usually occurs 4-8 days later (but can range from 2-12 days)
- Chikungunya is characterized by
  - An abrupt onset of fever, frequently accompanied by joint pain. The joint pain is often very debilitating; it usually lasts for a few days, but may be prolonged for weeks, months or even years
  - Other common signs and symptoms include muscle pain, joint swelling, headache, nausea, fatigue and rash

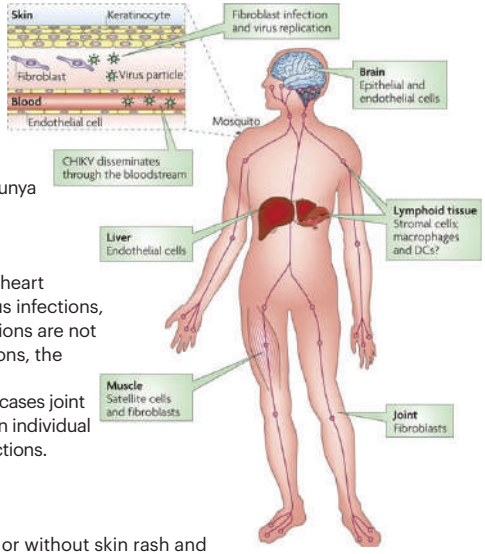
Reported chikungunya outbreaks in India and Indian Ocean Islands



- The symptoms in infected individuals are usually mild and the infection may go unrecognized or may be misdiagnosed
- In areas where there is co-circulation, chikungunya is often misdiagnosed as dengue. Unlike dengue however, chikungunya rarely progresses to become life threatening

Complications

- Occasional cases of ophthalmological, neurological and heart complications have been reported with chikungunya virus infections, as well as gastrointestinal complaints. Serious complications are not common, but in older people with other medical conditions, the disease can contribute to the cause of death
- Most patients recover fully from the infection, but in some cases joint pain may persist for several months, or even years. Once an individual is recovered, they are likely to be immune from future infections.



Transmission of chikungunya virus (CHIKV) occurs following a mosquito (Aedes aegypti or Aedes albopictus) bite. CHIKV then replicates in the skin, in fibroblasts, and disseminates to the liver, muscle, joints, lymphoid tissue (lymph nodes and spleen) and brain.

Diagnosis

Presumptive Case Definition

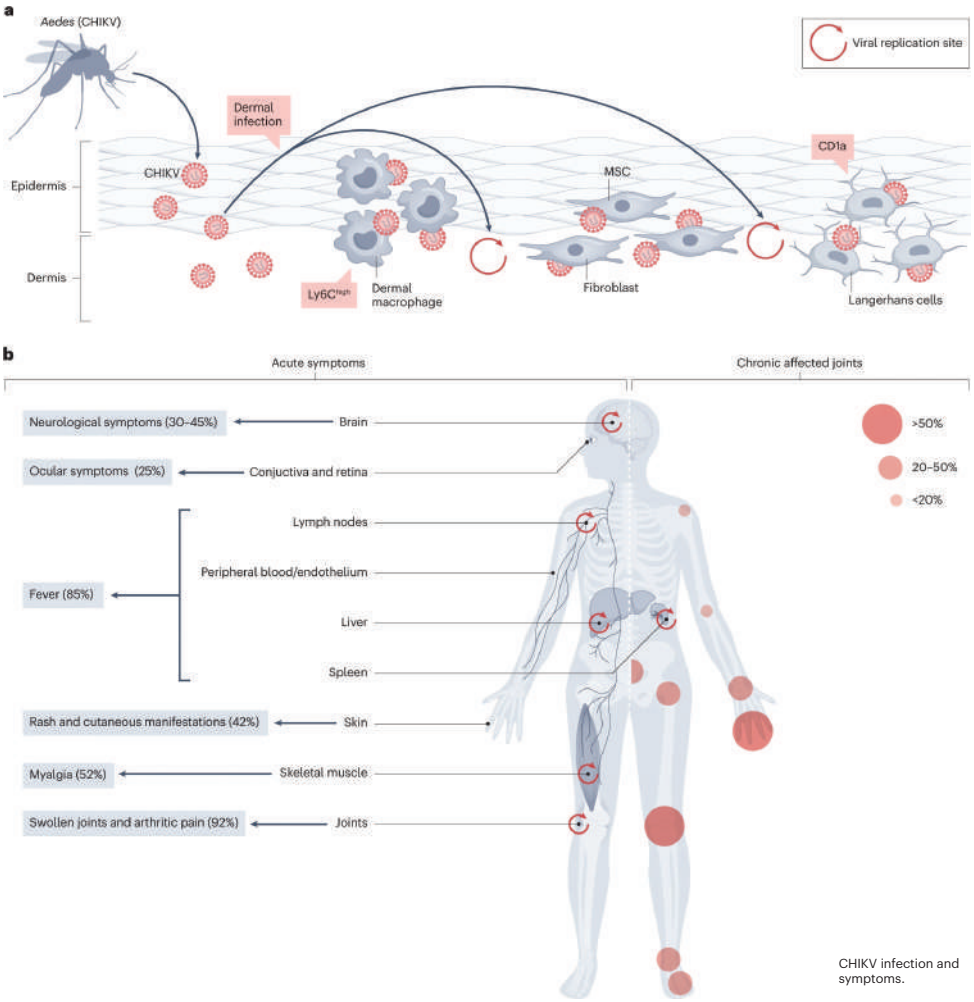
- Acute onset of fever and severe arthralgia/arthritis with or without skin rash and residing or having left an epidemic area 15 days prior to onset of symptoms.

Confirmed Case Definition

A patient meeting both the clinical and laboratory criteria.
Clinical criteria: Acute onset of fever and severe arthralgia/arthritis with or without skin rash and residing or having left an epidemic area 15 days prior to onset of symptoms.
Laboratory criteria: At least one of the following tests done in the acute phase of illness.
Direct evidence: Virus isolation/Presence of viral RNA by RT-PCR.
Indirect evidence: • Presence of virus specific IgM antibodies in single serum sample collected in acute or convalescent stage.
- Four-fold increase in IgG values in samples collected at least three weeks apart.

Treatment

- There is no specific antiviral drug treatment for chikungunya. The clinical management targets primarily to relieving the symptoms, including the joint pain using anti-pyretics, optimal analgesics, drinking plenty of fluids and general rest.
- Medicines such as paracetamol or acetaminophen are recommended to pain relief and reducing fever.



CHIKV infection and symptoms.

- Given the similarity of symptoms between chikungunya and dengue, in areas where both viruses circulate, suspected chikungunya patients should avoid using aspirin or non-steroidal anti-inflammatory drugs (NSAIDs) until which time a dengue diagnosis is ruled out (because in dengue, these medicines can increase the risk of bleeding).

Chikungunya mosquito *Aedes aegypti*.

Prevention

- There is neither chikungunya virus vaccine nor drugs are available to cure the infection. Prevention, therefore, centers on avoiding mosquito bites and eliminating mosquito breeding sites.
- To prevent mosquito bites
- Use mosquito repellents on skin and clothing
- When indoors, stay in well-screened areas. Use bed nets if sleeping in areas that are not screened or air-conditioned
- When working outdoors during day times, wear long-sleeved shirts and long pants to avoid mosquito bite

To eliminate mosquito breeding sites

Source Reduction Method

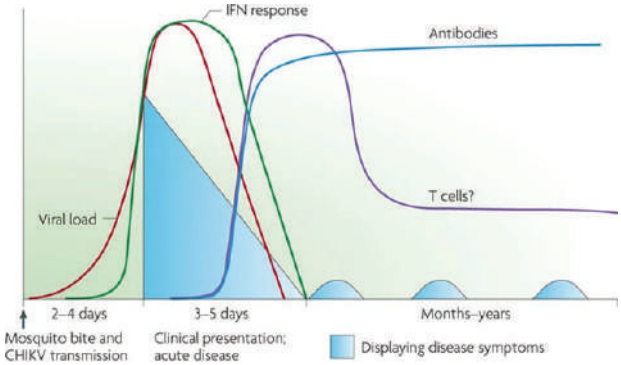
- By elimination of all potential vector breeding places near the domestic or peri- domestic areas
- Not allowing the storage of water for more than a week. This could be achieved by emptying and drying the water containers once in a week
- Straining of the stored water by using a clean cloth once a week to remove the mosquito larvae from the water and the water can be reused. The sieved cloth should be dried in the sun to kill immature stages of mosquitoes.

Use of Larvicides

- Where the water cannot be removed but used for cattle or other purposes. Temephos can be used once a week at a dose of one ppm (parts per million)
- Pyrethrum extract (0.1% ready-to-use emulsion) can be sprayed in rooms (not outside) to kill the adult mosquitoes hiding in the house.

Biological Control

- Introduction of larvivorous fish, namely Gambusia and Guppy in water tanks and other water sources.



Following transmission by mosquito bite, infected individuals experience an acute onset of disease 2–4 days after infection. Disease onset coincides with rising viral titre, which triggers the activation of an innate immune response. Patients successfully clear the virus approximately 1 week after infection. Importantly, ~30% of individuals experience long-term sequellae that include arthralgia and, in some cases, arthritis.

Outbreak Definitions

For Chikungunya, one or more cases in an area where no case was reported before is an outbreak

Type of Specimen	Type of Test	Volume to be collected	Timing of collection	Storage & Transport	Results
Whole Blood/ Serum	MAC-ELISA	10-15 ml of whole blood	• Acute phase: after 7 days of symptom onset • Convales-cent phase: 10-14 days later	• The blood specimen is transported at 4°C and not frozen for immediate transfer to the laboratory • If the testing cannot be done immediately, the serum specimen should be separated and then stored and shipped frozen	• Demonstration of IgM antibodies specific for CHIK virus • Demonstration of four-fold rise in antibody titre in acute and convalescent sera
	Detection of Viral RNA by RT-PCR		<= 8 days of symptom onset		

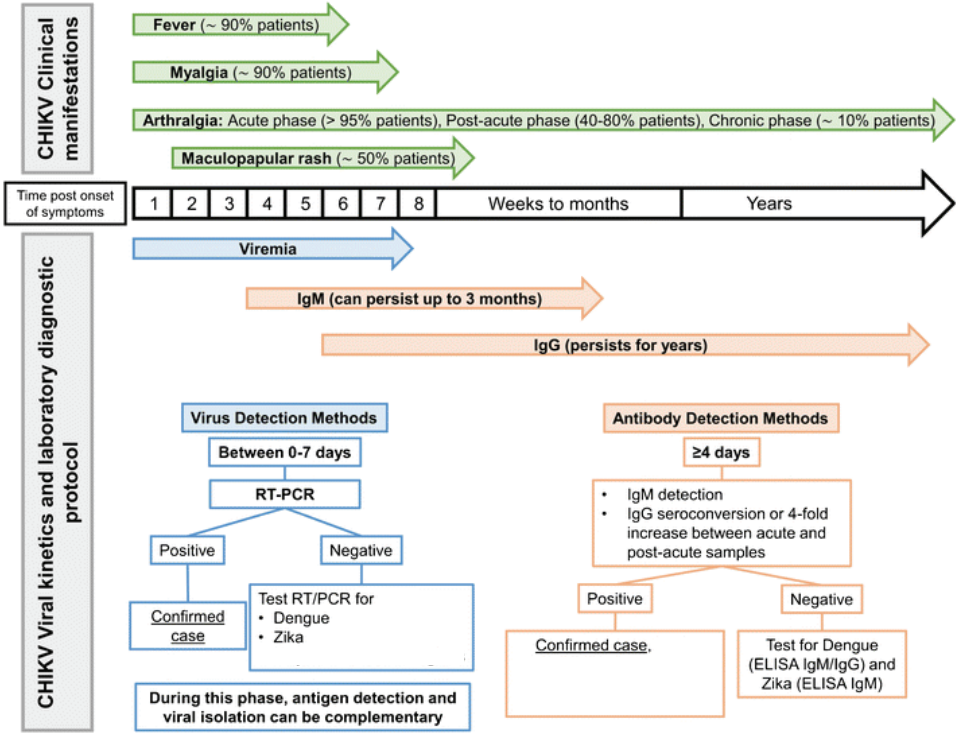
Public Health Measures to be Taken

- Fever survey and maintain a line list of cases
- Symptomatic management of cases
- Entomological assessment and Integrated Vector Control Measures
- Vaccination as per Government of India (GoI) guidelines.

REFERENCES

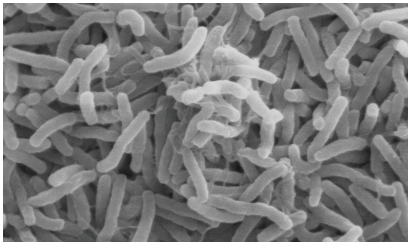
1. https://www.cdc.gov/chikungunya/index.html
2. https://www.who.int/news-room/fact-sheets/detail/chikungunya
3. https://www.nhp.gov.in/disease/musculo-skeletal-bone-joints-/chikungunya-fever
4. https://main.mohfw.gov.in/media/disease-alerts/chikungunya
5. https://nvbdcp.gov.in/

CHIKV infection timeline regarding clinical manifestations, viral and antibody kinetics, and protocol for laboratory diagnosis



(Source: Soto-Garita, Claudio, et al. "Advances in clinical diagnosis and Management of Chikungunya Virus Infection." Current Treatment Options in Infectious Diseases 10 (2018): 397-409.)

Cholera



A picture of cholera bacteria under a microscope.

Cholera is an acute diarrhoeal infection caused by ingestion of food or water contaminated with the bacterium Vibrio cholerae. There are many serogroups of V. cholerae, but only two – O1 and O139 – cause outbreaks.

Mode of Transmission

- Through faecally contaminated water, food or drinks
- Direct person to-person contact, especially in overcrowded, low sanitation settings, also add to transmission of infection.

Signs and Symptoms

- Incubation period is from few hours to five days; commonly one-two days
- Typical cases are characterized by sudden onset of profuse, effortless, watery diarrhea followed by vomiting, increased thirst, rapid dehydration, muscular cramps and suppression of urine
- In non-outbreak situations, Cholera may present as simple gastroenteritis or as watery diarrhea
- In an endemic situation, there could be many mild or asymptomatic cases or carriers

Who is at risk of infection?

- **In endemic areas, Cholera is predominantly a disease of children**
- **Cholera transmission is closely linked to inadequate access to clean water and sanitation facilities. Typical at-risk areas include peri-urban slums, and camps for internally displaced persons or refugees etc.**

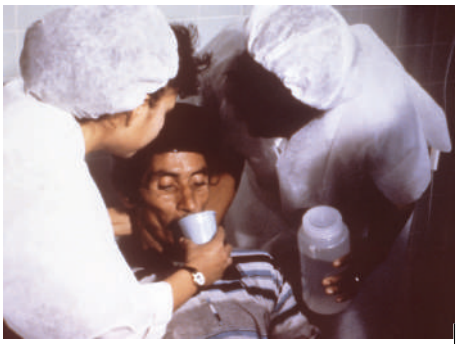
Complications

- Dehydration
- Circulatory failure
- Shock and electrolyte imbalance leading to acidosis, myocarditis, heart failure, tubular necrosis and eventual death

Diagnosis

- Acute watery diarrhea: It is an illness characterized by three or more loose or watery (non-bloody) stools within a 24-hour period.
- Suspected Cholera case: Any person aged two years or older presenting with acute watery diarrhea and severe dehydration or dying from acute watery diarrhea
- Confirmed Cholera case: A case of acute diarrhea with isolation and identification of vibrio cholerae serogroup O1 or O139 by culture of a stool specimen or on a Polymerase Chain Reaction (PCR) test.

The cholera patient should be encouraged to drink the Oral Rehydration Solution (ORS).

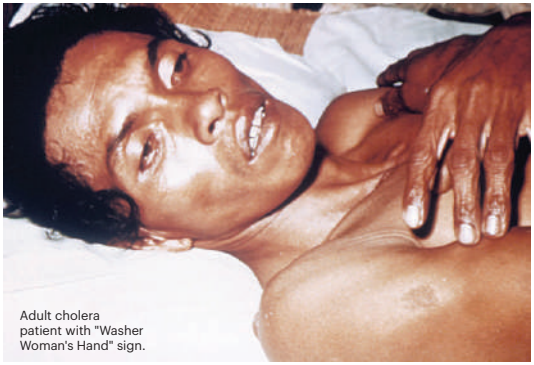


Treatment

- Cholera is an easily treatable disease. Majority of people can be treated successfully through prompt administration of oral rehydration solution (ORS). WHO/UNICEF ORS standard sachet is dissolved in one litre (L) of clean water
- Mass administration of antibiotics is not recommended, as it has no proven effect on the spread and may contribute to antimicrobial resistance.
- Zinc is an important adjunctive therapy for children under five. It reduces the duration of diarrhea and may prevent future episodes of other causes of acute watery diarrhea.
- Breastfeeding should also be promoted.

Dehydration Stage	Signs	Treatment
Severe	• Lethargic, unconscious, floppy Sunken eyes • Drinks poorly/unable to drink • Mouth very dry • Skin pinch goes back very slowly • No tears (only for children)	IV therapy + antibiotics + ORS
Mild	• Restless and irritable • Sunken eyes • Dry mouth • Thirsty, drinks eagerly • Skin pinch goes back very slowly • No tears (only for children)	ORS + very close monitoring
No Dehydration	None of the above signs	ORS at home

Source: Cholera Outbreak: Assessing the outbreak response and improving preparedness. WHO 2004. Global Task Force on Cholera Control


Adult cholera patient with "Washer Woman's Hand" sign.


A U.S. Navy hospital corpsman, member of a USAID military health team, inoculates a flood refugee against cholera at the refugee center.

Public Health Measures to be Taken

- **Identify and maintain a line list of cases**
- **Health education activities to promote safe water drinking practices**
- **Regular water quality checks in the community**
- **Sanitation survey in the community**

Prevention

Health Education

- Drink water only from a safe source or water that has been disinfected (boiled or chlorinated)
- Cook food or reheat it thoroughly and eat it while it is still hot. Boil milk before drinking
- Avoid ice creams from unreliable sources
- Avoid uncooked food unless it can be peeled or shelled
- Wash your hands after any contact with excreta and before preparing or eating food
- Dispose human excreta promptly and safely

Immunization

The efficiency of the Cholera vaccine is limited and duration of protection is short, hence it is essential that vaccine is used with discrimination. Cholera vaccines can be used as an adjunct to other preventive measures such as drug prophylaxis, proper sanitation and health education.

Outbreak Definitions

Suspected cholera outbreak is defined by the detection of at least one of the following:

- Two or more people aged above two years of age with acute watery diarrhea and severe dehydration, or dying from acute watery diarrhea, from the same area, within one week of one another

Laboratory Investigation for Confirmation

Type of Specimen	Timing	Storage & Transport	Tests Performed	Results
Stool	Within the first four days of illness and, if possible, before any antimicro-bial therapy has been started	Preserve the sample in Cary-Blair transport medium and send the sample to reach the laboratory within seven days after taking the sample at room temperature	Direct microscopic examination	Darting motility; Motility ceases on mixing with polyvalent anti cholera diagnostic serum
			Culture methods: • Bile salt agar medium (BSA) • TCBS (Thiosulphate Citrate Bile Salt Sucrose agar)	• Translucent, oil drop like colonies on BSA that stain as gram negative coccobacilli, are oxidase, lysine and ornithine positive • Yellow colonies
			Serotyping	• Vibrio cholerae serogroup O1 • Vibrio cholerae serogroup 0 139 • Non-agglutinable (NAG) vibrios/Non-cholera vibrios (NCV)/ Non O1 Vibrios.
			Biotyping	Classical and El Tor

- One death from severe acute watery diarrhea in a person above five years of age
- One case of acute watery diarrhea testing positive for cholera by rapid diagnostic test (RDT) in an area that has not yet detected a confirmed case of cholera (including areas at risk for extension from a current outbreak).

Confirmed Cholera Outbreak

A Cholera outbreak is defined by the occurrence of at least one confirmed case of Cholera and evidence of local transmission.

Prof. Sambhu Nath De was a Bengali Medical Scientist. Prof. De discover the pathogen of cholera, Cholera toxin. His contribution on it is the milestone for cholera research.

Hemendra Nath Chatterjee's Hemendra Nath Chatterjee's discovery, the Oral rehydration therapy for replenishing the massive fluid loss in cholera patients, has saved innumerable lives.

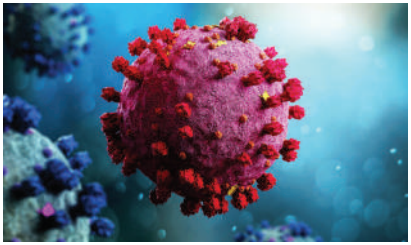
REFERENCES

1. https://ncdc.gov.in/

2. https://www.who.int/news-room/fact-sheets/detail/cholera

3. Cholera Outbreak Response Field Manual, October 2019, Global Task Force on Cholera Control

COVID-19



3D visualization of SARS-CoV-2/ COVID-19 virus.

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus.

Mode of Transmission

SARS-CoV-2 is primarily transmitted between people through respiratory droplets and contact routes and, to a lesser degree, via contaminated surfaces. Most common mode of transmission is droplets expelled during face-to-face exposure during talking, coughing, or sneezing.

Who is at risk of infection?

- **COVID-19 can affect anyone, and the disease can cause symptoms ranging from mild to very severe**
- **Serious illness is more likely in elderly and those with underlying medical conditions and those who are immunocompromised.**

Signs and Symptoms

Symptoms usually begin 5-6 days after exposure and last 1-14 days:

- COVID-19 patients have reported the following signs and symptoms: Fever, cough, general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, anorexia/nausea/vomiting, diarrhoea, altered mental status, loss of smell (anosmia) or loss of taste (ageusia)
- Older people and immune-suppressed patients in particular may present with atypical symptoms such as fatigue, reduced alertness, reduced mobility, diarrhoea, loss of appetite, delirium, and absence of fever
- Children might not have fever or cough as frequently as adults.

Complications

- The consequences of severe COVID-19 include death, respiratory failure, sepsis, thromboembolism, and multiorgan failure.
- In rare situations, children can develop a severe inflammatory syndrome a few weeks after infection.
- Some people who have had COVID-19, whether they have needed hospitalization or not, continue to experience symptoms. These long-term effects are called long COVID (or post COVID-19 condition). The most common symptoms associated with long COVID include fatigue, breathlessness and cognitive dysfunction (for example, confusion, forgetfulness, or a lack of mental focus or clarity). Long COVID can affect a person's ability to perform daily activities such as work or household chores.

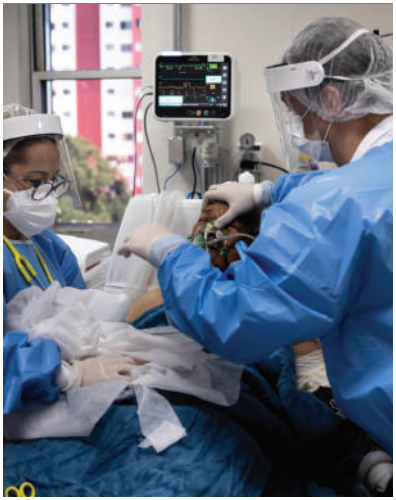
Diagnosis

Suspect Case: A patient with acute respiratory illness {fever and at least one sign/ symptom of respiratory disease (e.g., cough, shortness of breath)}, AND a history of travel to or, residence in a country/area or territory reporting local transmission of COVID-19 disease during the 14 days prior to symptom onset; OR

- A patient/Health care worker with any acute respiratory illness AND having been in contact with a confirmed COVID-19 case in the last 14 days prior to onset of symptoms; OR
- A patient with severe acute respiratory infection {fever and at least one sign/symptom of respiratory disease (e.g., cough, shortness breath)} AND requiring hospitalization AND with no other etiology that fully explains the clinical presentation; OR
- A case for whom testing for COVID-19 is inconclusive.

Laboratory Confirmed Case

- A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.



A team of doctors, nurses and physiotherapists take care of critical patients with COVID-19 in the ICU.

Definition of a Contact

A contact is a person that is involved in any of the following:

- Providing direct care without proper personal protective equipment (PPE) for COVID-19 patients
- Staying in the same close environment of a COVID-19 patient (including workplace, classroom, household, gatherings)
- Traveling together in close proximity (1 m) with a symptomatic person who later tested positive for COVID-19

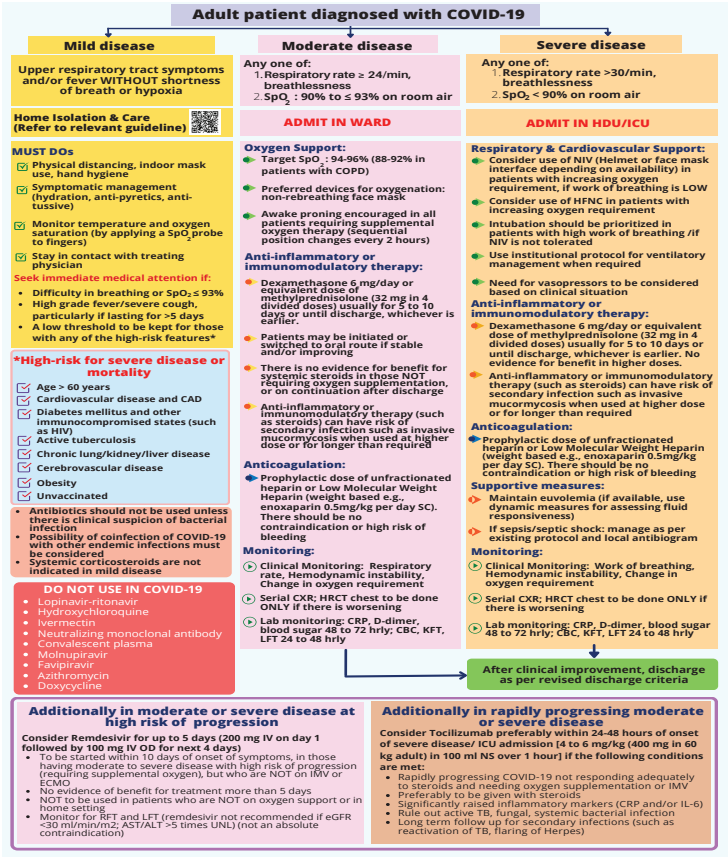
High Risk Contact

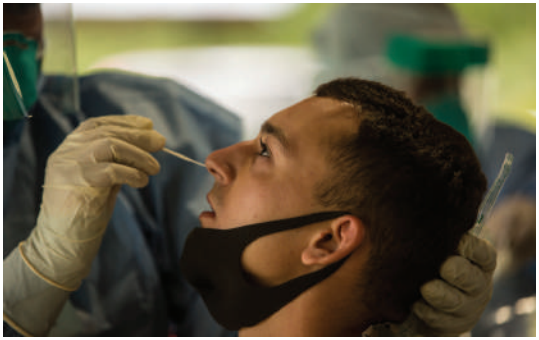
- Touched body fluids of the patient (Respiratory tract secretions, blood, vomit, saliva, urine, faeces)
- Had direct physical contact with the body of the patient including physical examination without PPE.
- Touched or cleaned the linens, clothes, or dishes of the patient.
- Lives in the same household as the patient.
- Anyone in close proximity (within 3 ft) of the confirmed case without precautions.
- Passenger in close proximity (within 3 ft) of a conveyance with a symptomatic person who later tested positive for COVID-19 for more than 6 hours.

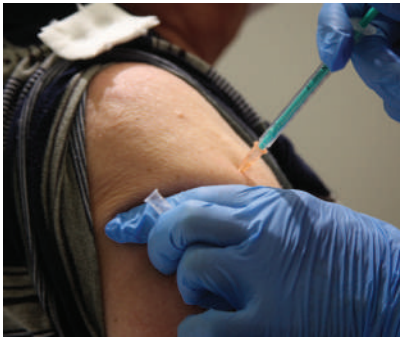
Low Risk Contact

- Shared the same space (Same class for school/worked in same room/similar and not having a high-risk exposure to confirmed or suspect case of COVID-19)
- Travelled in same environment (bus/train/flight/any mode of transit) but not having a high-risk exposure.

Treatment


Adult patient diagnosed with COVID-19
Mild disease
Upper respiratory tract symptoms and/or fever WITHOUT shortness of breath or hypoxia
Home Isolation & Care (Refer to relevant guideline)
MUST DOs
Physical distancing, indoor mask use, hand hygiene
Symptomatic management (hydration, anti-pyretics, anti-tussive)
Monitor temperature and oxygen saturation (by applying a SpO2 probe to fingers)
Stay in contact with treating physician
Seek immediate medical attention if:
Difficulty in breathing or SpO2 ≤ 93%
High grade fever/severe cough, particularly if lasting for >5 days
A low threshold to be kept for those with any of the high-risk features*
*High-risk for severe disease or mortality
Age > 60 years
Cardiovascular disease and CAD
Diabetes mellitus and other immunocompromised states (such as HIV)
Active tuberculosis
Chronic lung/kidney/liver disease
Cerebrovascular disease
Obesity
Unvaccinated
Antibiotics should not be used unless there is clinical suspicion of bacterial infection
Possibility of coinfection of COVID-19 with other endemic infections must be considered
Systemic corticosteroids are not indicated in mild disease
DO NOT USE IN COVID-19
Lopinavir-ritonavir
Hydroxychloroquine
Ivermectin
Neutralizing monoclonal antibody
Convalescent plasma
Molnupiravir
Favipiravir
Azithromycin
Doxycycline
Moderate disease
Any one of:
1. Respiratory rate ≥ 24/min, breathlessness
2. SpO2 : 90% to ≤ 93% on room air
ADMIT IN WARD
Oxygen Support:
Target SpO2 : 94-96% (88-92% in patients with COPD)
Preferred devices for oxygenation: non-rebreathing face mask
Awake proning encouraged in all patients requiring supplemental oxygen therapy (sequential position changes every 2 hours)
Anti-inflammatory or immunomodulatory therapy:
Dexamethasone 6 mg/day or equivalent dose of methylprednisolone (32 mg in 4 divided doses) usually for 5 to 10 days or until discharge, whichever is earlier.
Patients may be initiated or switched to oral route if stable and/or improving
There is no evidence for benefit for systemic steroids in those NOT requiring oxygen supplementation, or on continuation after discharge
Anti-inflammatory or immunomodulatory therapy (such as steroids) can have risk of secondary infection such as invasive mucormycosis when used at higher dose or for longer than required
Anticoagulation:
Prophylactic dose of unfractionated heparin or Low Molecular Weight Heparin (weight based e.g., enoxaparin 0.5mg/kg per day SC). There should be no contraindication or high risk of bleeding
Monitoring:
Clinical Monitoring: Respiratory rate, Hemodynamic instability, Change in oxygen requirement
Serial CXR; HRCT chest to be done ONLY if there is worsening
Lab monitoring: CRP, D-dimer, blood sugar 48 to 72 hrly; CBC, KFT, LFT 24 to 48 hrly
Severe disease
Any one of:
1. Respiratory rate >30/min, breathlessness
2. SpO2 < 90% on room air
ADMIT IN HDU/ICU
Respiratory & Cardiovascular Support:
Consider use of NIV (Helmet or face mask interface depending on availability) in patients with increasing oxygen requirement, if work of breathing is LOW
Consider use of HFNC in patients with increasing oxygen requirement
Intubation should be prioritized in patients with high work of breathing /if NIV is not tolerated
Use institutional protocol for ventilatory management when required
Need for vasopressors to be considered based on clinical situation
Anti-inflammatory or immunomodulatory therapy:
Dexamethasone 6 mg/day or equivalent dose of methylprednisolone (32 mg in 4 divided doses) usually for 5 to 10 days or until discharge, whichever is earlier. No evidence for benefit in higher doses.
Anti-inflammatory or immunomodulatory therapy (such as steroids) can have risk of secondary infection such as invasive mucormycosis when used at higher dose or for longer than required
Anticoagulation:
Prophylactic dose of unfractionated heparin or Low Molecular Weight Heparin (weight based e.g., enoxaparin 0.5mg/kg per day SC). There should be no contraindication or high risk of bleeding
Supportive measures:
Maintain euvolemia (if available, use dynamic measures for assessing fluid responsiveness)
If sepsis/septic shock: manage as per existing protocol and local antibiogram
Monitoring:
Clinical Monitoring: Work of breathing, Hemodynamic instability, Change in oxygen requirement
Serial CXR; HRCT chest to be done ONLY if there is worsening
Lab monitoring: CRP, D-dimer, blood sugar 48 to 72 hrly; CBC, KFT, LFT 24 to 48 hrly
After clinical improvement, discharge as per revised discharge criteria
Additionally in moderate or severe disease at high risk of progression
Consider Remdesivir for up to 5 days (200 mg IV on day 1 followed by 100 mg IV OD for next 4 days)
To be started within 10 days of onset of symptoms, in those having moderate to severe disease with high risk of progression (requiring supplemental oxygen), but who are NOT on IMV or ECMO
No evidence of benefit for treatment more than 5 days
NOT to be used in patients who are NOT on oxygen support or in home setting
Monitor for RFT and LFT (remdesivir not recommended if eGFR <30 ml/min/m2; AST/ALT >5 times ULN) (not an absolute contraindication)
Additionally in rapidly progressing moderate or severe disease
Consider Tocilizumab preferably within 24-48 hours of onset of severe disease/ ICU admission [4 to 6 mg/kg (400 mg in 60 kg adult) in 100 ml NS over 1 hour] if the following conditions are met:
Rapidly progressing COVID-19 not responding adequately to steroids and needing oxygen supplementation or IMV
Preferably to be given with steroids
Significantly raised inflammatory markers (CRP and/or IL-6)
Rule out active TB, fungal, systemic bacterial infection
Long term follow up for secondary infections (such as reactivation of TB, flaring of Herpes)





Prevention

To prevent the spread of COVID-19:

- Avoid crowds and keep a safe distance from others, even if they don't appear to be sick;
- Wear a properly fitted mask if you feel sick, have been close to people who are sick, if you are at high-risk, or in crowded or poorly ventilated areas;
- Clean your hands frequently with alcohol-based hand rub or soap and water;
- Cover your mouth and nose with a bent elbow or tissue when you cough or sneeze;
- Dispose of used tissues right away and clean your hands; and
- If you develop symptoms or test positive for COVID-19, self-isolate until you recover.

Vaccination has been shown to contribute to reducing deaths and severe illness from COVID-19, and to reduce the transmission of COVID-19.

Laboratory Investigation for Confirmation

Spectrum of Tests available for COVID-19:

- **Point-of-Care Tests:** Home or Self-Test/Rapid Antigen Test (RAT)
- **Molecular Tests:** rRT-PCR, TrueNat, CBNAAT, CRISPR, RT-LAMP, Rapid Molecular Testing Systems

Important Points to Consider

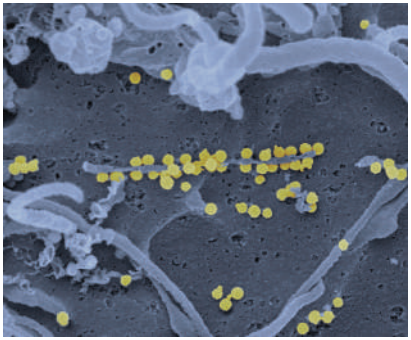
- A positive point-of-care test (Home or Self-test/RAT) and Molecular Test is to be considered confirmatory, without any repeat testing.
- Symptomatic individuals, testing negative on Home/Self-test or RAT should undertake rRT-PCR
- Individuals who came in contact with known cases of COVID-19, should wait for at least 5 days to get themselves tested for COVID-19.

Far Left: A patient undergoing an RTPCR test to detect COVID-19 virus.
Above: COVID-19 Vaccine being administered.

REFERENCES

1. https://ncdc.gov.in/
2. https://www.mohfw.gov.in/
3. https://www.who.int/health-topics/coronavirus
4. https://www.icmr.gov.in/pdf/covid/techdoc/COVID_Clinical_Management_19032023.pdf
5. Advisory on Purposive Testing Strategy for COVID-19 in India (Version IX, dated 8th February 2023), ICMR
6. CD Alert on COVID-19, NCDC

Crimean-Congo Haemorrhagic Fever (CCHF)



Scanning electron micrograph of CCHF viral particles (yellow) budding from the surface of cultured epithelial cells from a patient.

Crimean-Congo Haemorrhagic Fever (CCHF) is a viral haemorrhagic fever caused by tick-borne virus of the Nairovirus group. The disease was first identified in Crimea (former USSR) in 1944 and given the name Crimean Haemorrhagic Fever.

CCHF virus belongs to family Bunyaviridae, genus Nairovirus. It is an enveloped, single stranded negative-sense RNA virus with tripartite genome.

Ixodid (hard) ticks, especially those of the genus, Hyalomma, are both a reservoir and a vector for the CCHF virus. Numerous wild and domestic animals, such as cattle, goats, sheep and hares, serve as hosts for the virus.

Who is at risk of infection?

- **Animal herders**
- **Livestock owners**
- **Slaughterhouse workers**
- **Healthcare workers attending to CCHF patients without following contact precautions**

Mode of Transmission

Animal to Human Transmission

Transmission to humans occurs if they come in contact with infected ticks or animal blood.

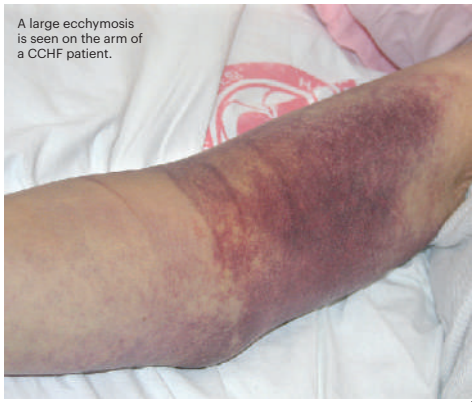
Human to Human Transmission

Human transmission of CCHF can result from close contact with infectious blood or bodily fluids of infected patients and wastes from patients with CCHF.

Incubation period is usually 5-6 days, with a documented maximum period of 13 days.

Signs and Symptoms

Sudden onset of fever, myalgia, dizziness, neck pain, stiffness, backache, headache, sore eyes and photophobia. There may be nausea, vomiting and sore throat early on, which may be accompanied by diarrhea and generalized abdominal pain.



A large ecchymosis is seen on the arm of a CCHF patient.

Top: Congo fever paitent being treated at a hospital.

The tick bourne Crimean-Congo hemorrhagic fever virus causes severe viral hemorrhagic fever outbreaks.

Complications

Hepatorenal and pulmonary failure. The mortality rate from CCHF is approximately 9-50% with death occurring in the second week of illness

Diagnosis

Presumptive Case Definition

Suspected Case

A patient with abrupt onset of high fever >38.5°C and one of the following symptoms:

Severe headache, myalgia, nausea, vomiting, and/or diarrhea
AND/OR
History of insect (tick) bite within 14 days prior to the onset of symptoms;
OR
History of contact with tissues, blood, or other biological fluids from a possibly infected animal (e.g., abattoir workers, livestock owners, veterinarians) within 14 days prior to the onset of symptoms;
OR
History of exposure to a suspect, probable, or laboratory-confirmed CCHF case, within 14 days prior to the onset of symptoms (contacts of the patient including health care workers)

Presumptive Case

A suspected CCHF case with two of the following hemorrhagic manifestations: Petechiae, purpuric rash, rhinorrhagia, hematemesis, hemoptysis, gastrointestinal hemorrhage, gingival hemorrhage,
OR
Any other hemorrhagic manifestation in the absence of any known precipitating factor for hemorrhagic manifestation

Laboratory Confirmed Case

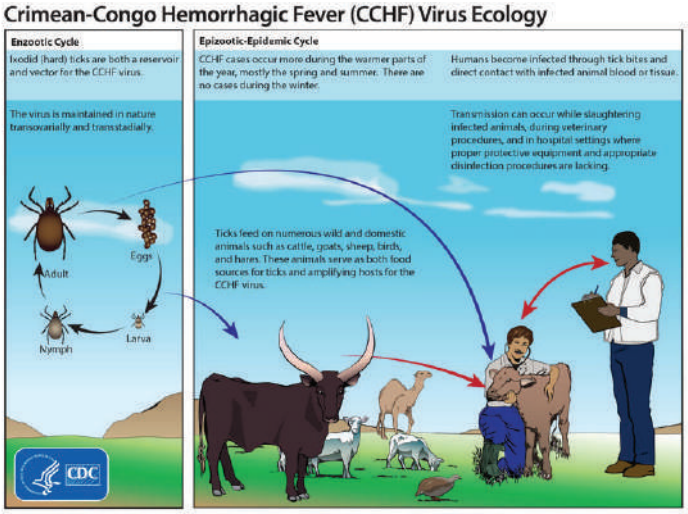
A presumptive case with; Detection of CCHF virus genome by validated RT-PCR in a clinical specimen and/or sequencing
OR

This graphic shows the life cycle of the CCHF virus. Hard ticks are both a reservoir and vector for the CCHF virus. Humans become infected through tick bites and through direct contact with infected animal blood or tissue. The ticks feed on numerous wild and domestic animals, like cattle, goats, sheet and hares. Transmission of the virus can occur during slaughtering of infected animals, during veterinary procedures, and in hospital settings.

CDC

Public Health Measures to be Taken

- **Contact tracing of cases**
- **Universal Precautions to prevent exposure to blood and body fluids**
- **Vaccination as per GoI guidelines**
- **Behavior change communication to avoid high risk activities**
- **Immunize health personnel in hospitals.**



Detection by ELISA or IFA of specific IgM antibodies against CCHF virus
OR
A four-fold increase in specific IgM antibodies against CCHF virus in two specimens collected in the acute and convalescence phases
OR
CCHF virus isolation.

Treatment

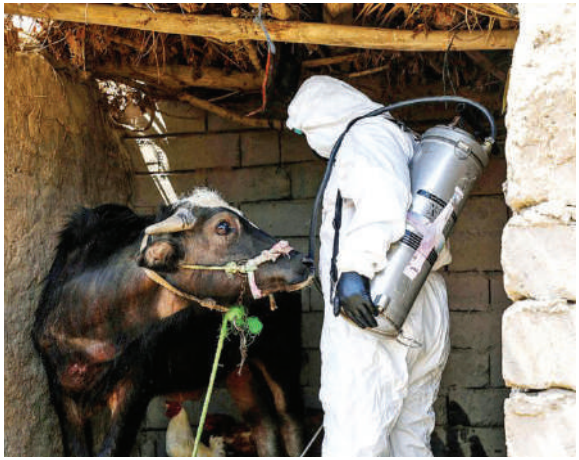
Treatment for CCHF is primarily supportive. Care should include careful attention to fluid balance and correction of electrolyte abnormalities, oxygenation and hemodynamic support, and appropriate treatment of secondary infections. The antiviral drug ribavirin has been used to treat CCHF infection with apparent benefit. Both oral and intravenous formulations seem to be effective.

Ribavirin dosage for adults
(Intravenous/Oral)

- 2 gm loading dose
- 4 gm/day in four divided doses (six hourly) for 4 days
- 2 gm/day in four divided doses for 6 days

Ribavirin dosage for children
(Intravenous)
- 17 mg/kg loading dose
- 17 mg/kg six hourly, day 1-4
- 8 mg/kg eight hourly, day 5-10

(Oral)
- 30 mg/kg loading dose
- 15 mg/kg six hourly, day 1-4
- 7 mg/kg six hourly, day 5-10



A health worker disinfects calves at a small farm, where a woman was infected with the tick-borne Crimean-Congo hemorrhagic fever.

Prevention

- Agricultural workers and others working with animals in endemic areas should use insect repellent on exposed skin and clothing. Insect repellants containing DEET (N, N-diethyl-m-toluamide) are the most effective in warding off ticks.
- Wearing gloves and other protective clothing is recommended for high-risk population such as farmers, health care workers etc.
- Individuals should avoid contact with blood and body fluids of livestock or humans who show symptoms of infection.
- Tick control in the affected areas in cattle can be undertaken in consultation with animal husbandry department.
- Universal precautions should be strictly adhered to in all healthcare facilities dealing with suspected, probable and confirmed cases of CCHF.
- Health-care workers caring for patients with suspected or confirmed CCHF, or handling their clinical specimens, should implement standard infection control precautions. These include basic hand hygiene, use of personal protective equipment, safe injection practices and safe burial practices.

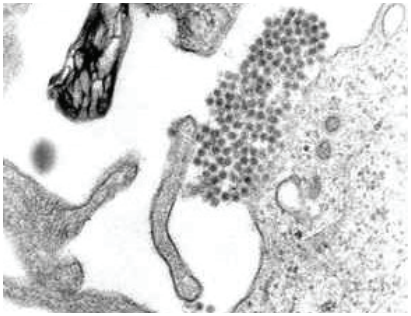
Laboratory Investigation for Confirmation

Type of specimen	Test	Volume	Mode of Collection	Transportation
Blood/serum/plasma	IgG/ IgM Elisa	2 ml	Clean sterile vial	In cold chain (2-8ºC)

REFERENCES

1. Home :: Integrated Disease Surveillance Programme(IDSP)
2. https://ncdc.gov.in/WriteReadData/linkimages/January7434567273.pdf
3. https://www.cdc.gov/vhf/crimean-congo/pdf/factsheet.pdf
4. https://www.who.int/news-room/fact-sheets/detail/crimean-congo-haemorrhagic-fever#:-:text=The%20incubation%20period%20following%20contact,photophobia%20(sensitivity%20to%20light).

Dengue



A TEM micrograph showing Dengue virus virions.

Dengue is a mosquito-borne viral disease caused by dengue virus (DENV) belonging to the genus flavivirus and consisting of four serotypes (DENV-1, DENV-2, DENV-3 and DENV-4). It occurs in two forms – Dengue Fever and Dengue Haemorrhagic Fever (DHF).

Mode of Transmission

Dengue virus is transmitted to humans through the bite of infected female Aedes aegypti mosquito. Aedes aegypti is the most common vector in urban areas, however Aedes albopictus also acts as a vector for dengue in some areas. Humans develop symptoms after 5-6 days of being bitten by an infected mosquito.

After feeding on an DENV-infected person, the virus replicates in the mosquito midgut, before it disseminates to secondary tissues, including the salivary glands.

Aedes mosquito commonly breeds in the following domestic man-made objects- coolers, drums, pots, buckets, flower vases, tanks, tyres, roof gutters, refrigerator drip pans, cement blocks, bamboo stumps, coconut shells, tree holes and any other places where rainwater is collects or stored.

Who is at risk of infection?

- **All age groups and both sexes are affected**
- **Deaths are more commonly seen in children during DHF outbreaks**
- **Secondary infection with dengue is a risk factor for DHF**
- **Travel to dengue endemic areas is also an important risk factor.**

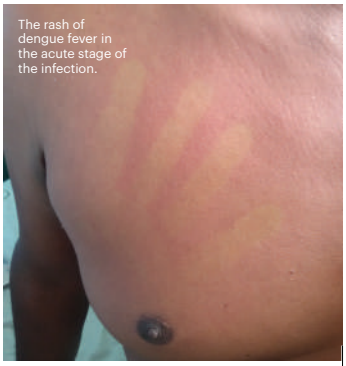
Period of Communicability

The Aedes mosquito becomes infective by feeding on a patient from the day before onset till the fifth day (viraemia stage) of illness. After an extrinsic incubation period of eight to ten days, the mosquito becomes infective, and is able to transmit the infection to humans.

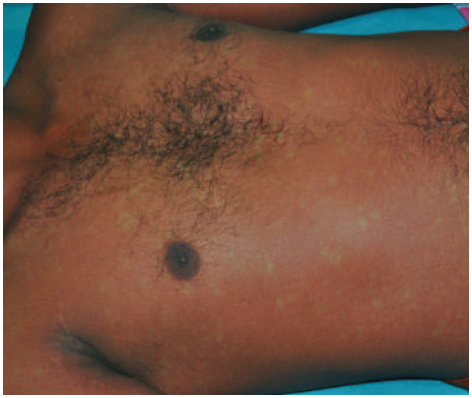
Signs and Symptoms

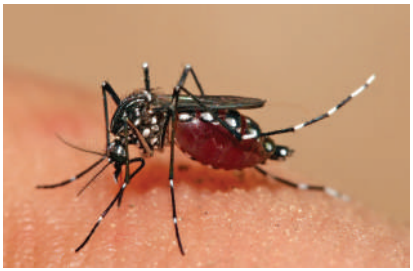
The following signs and symptoms are commonly seen in patients with dengue fever;

- Abrupt onset of high fever
- Severe frontal headache
- Pain behind the eyes which worsens with eye movement
- Muscle and joint pains
- Loss of sense of taste and appetite
- Measles-like rash over chest and upper limbs
- Nausea and vomiting



The rash of dengue fever in the acute stage of the infection.





Top: The rash that commonly forms during the recovery from dengue fever with its classic islands of white in a sea of red.

Above: Aedes Aegypti feeding.

The following signs and symptoms are commonly seen in Dengue Haemorrhagic Fever (DHF) and shock syndrome (DSS):

- Symptoms similar to dengue fever
- Severe continuous stomach pains
- Skin becomes pale, cold or clammy
- Bleeding from nose, mouth and gums and skin rashes
- Frequent vomiting with or without blood
- Sleepiness and restlessness
- Patient feels thirsty and mouth becomes dry
- Rapid weak pulse
- Difficulty in breathing

World Health Organization defines DHF by the following four criteria:

1. Fever or recent history of fever lasting 2-7 days
2. Any hemorrhagic manifestation
3. Thrombocytopenia (platelet count of<1,00,000/mm^3)
4. Evidence of increased vascular permeability

Diagnosis

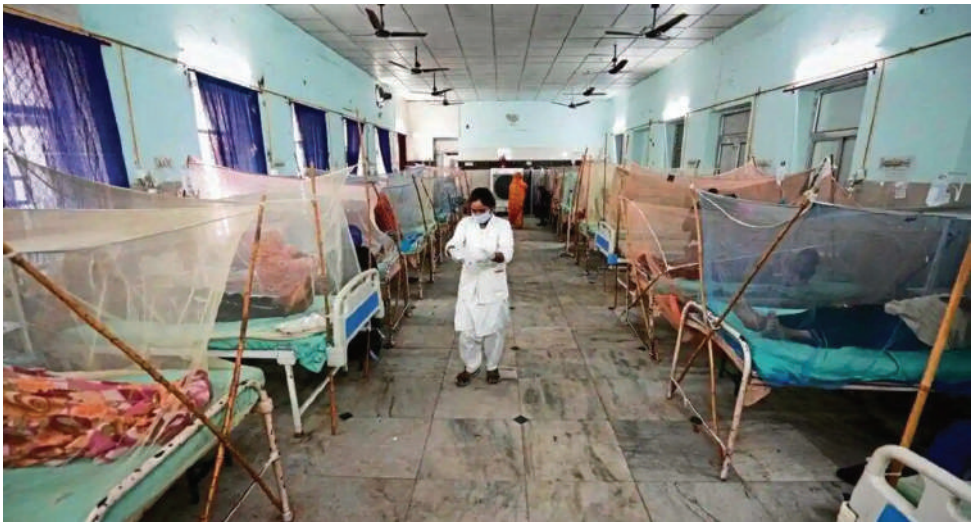
Presumptive Case Definition

A case compatible with clinical description (see below) of dengue fever during outbreak: OR Non-ELISA based NS1 antigen/IgM positive.
(A positive test by RDT will be considered as probable due to poor sensitivity and specificity of currently available RDTs.)
Clinical Description of Dengue: The clinical description of Dengue Fever includes an acute febrile illness of 2-7 days duration with two or more of the following manifestations:
• Headache • Retro-orbital pain • Myalgia • Arthralgia • Rash • Haemorrhagic Manifestations

Laboratory Confirmed Case

A case compatible with the clinical description (see below) of Dengue Fever with at least one of the following:

- Isolation of dengue virus (Virus culture+VE) from serum, plasma, leucocytes
- Demonstration of IgM antibody titre by ELISA positive in single serum sample
- Demonstration of dengue virus antigen in serum sample by NS1-ELISA
- IgG seroconversion in paired sera after two weeks of fourfold increase of IgG titre
- Detection of viral nucleic acid by polymerase chain reaction (PCR).



Dengue patients in a government hospital ward.

Public Health Measures to be Taken

- **Fever survey and maintain a line list of cases**
- **Symptomatic management of cases**
- **Entomological Assessment and Integrated Vector Control Measures**
- **Vaccination as per GoI guidelines.**

Treatment

- There is no specific treatment for dengue fever.
- Patients should rest, stay hydrated and seek medical advice.
- Supportive care such as fever reducers and pain killers can be taken to control the symptoms of muscle aches and pains, and fever with acetaminophen or paracetamol. NSAIDs (non-steroidal anti-inflammatory drugs), such as ibuprofen and aspirin should be avoided.
- Patients should report immediately to the nearest health facility in case of the following; no clinical improvement, severe abdominal pain, persistent vomiting, cold and clammy extremities, sudden drop in temperature, lethargy or irritability/ restlessness, bleeding from any site, not passing urine for more than 12 hours.
- Management of DHF/shock to be done as per national guidelines.

Prevention

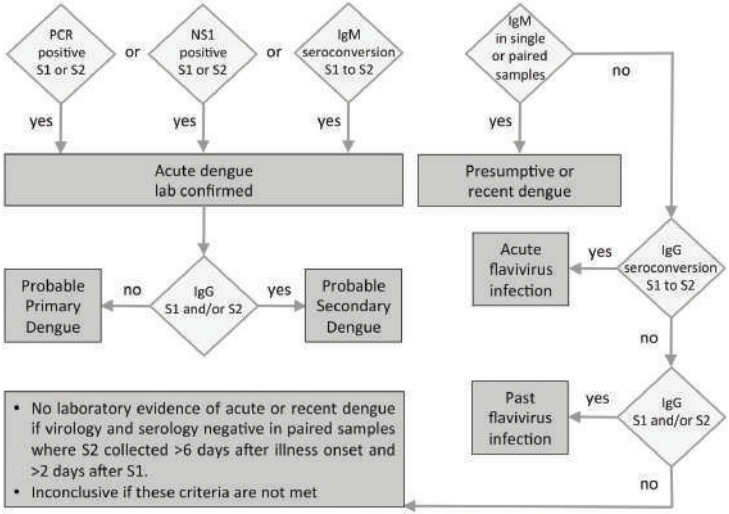
- Integrated vector control management.
- Personal protection measures such as wearing full sleeved clothes, use of mosquito repellent creams and insecticide treated nets for sleeping.

Laboratory Investigation for Confirmation

Name of Diagnostic Test	Type of Sample to be Collected	Volume of Sample Required	Transportation
NS1 Antigen Test	Serum	2 ml	In cold chain (2-8° Celsius)
IgM Elisa	Serum	2 ml	

Anti-mosquito fogging operation.

Diagnostic algorithm for laboratory confirmation of dengue virus infection. Polymerase chain reaction (PCR

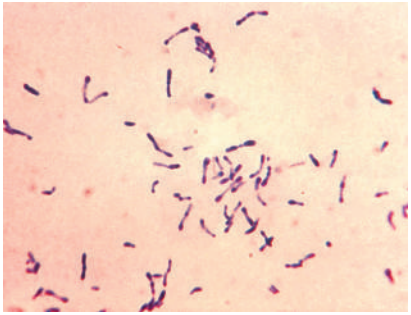


J Infect Dis, Volume 215, Issue suppl_2, 1 March 2017, Pages S89–S95, https://doi.org/10.1093/infdis/jiw649

REFERENCES

1. https://www.cdc.gov/dengue/about/index.html
2. https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue
3. https://nvbdcp.gov.in/index1.php?lang=1&level=1&sublinkid=5899&lid=3686
4. National Guideline for Clinical Management of Dengue

Diptheria



Corynebacterium diphtheriae Gram stain.
WIKIPEDIA/CDC

Diphtheria is an acute infectious disease of upper respiratory system, caused by toxigenic strains of Corynebacterium diphtheriae. The most common form of the disease affects the throat and the tonsils. Other forms can cause skin infections.

Mode of Transmission

Diphtheria spreads easily between people by direct contact or through respiratory droplets in air, like from coughing or sneezing. It may also spread by contaminated clothing and objects. The incubation period is 2-5 days (range 1-10 days).

A person is infectious as long as virulent bacilli are present in discharges and lesions. Organisms usually persists for 2 weeks, and seldom more than 6 weeks without antibiotics.

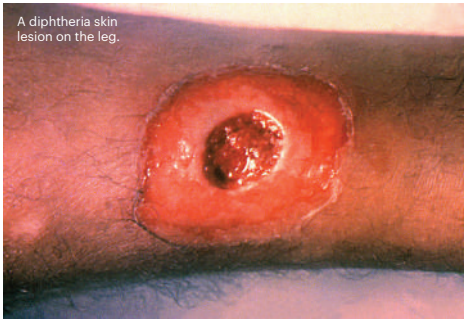
Who is at risk of infection?

- **All ages are susceptible who are unimmunized or partially immunized**
- **People in the same household or in close contact with a diphtheria patient or if directly exposed to secretions from the suspected infection site (e.g., mouth, skin) of the patient are at increased risk.**

Signs and Symptoms

- Most infections are asymptomatic or mild in nature
- Can be broadly classified into
  - Respiratory diphtheria
  - Nasal diphtheria
  - Pharyngeal and Tonsillar diphtheria
  - Laryngeal diphtheria
  - Cutaneous diphtheria

- Respiratory diphtheria has a gradual onset and is characterized by:
  - Mild fever
  - Sore throat
  - Difficulty swallowing
  - Malaise
  - Loss of appetite
  - Hoarseness (if the larynx is involved)
  - The hallmark of respiratory diphtheria is a pseudomembrane that appears within 2-3 days of illness. It appears over the mucous lining of the tonsils, pharynx, larynx, or nares and can extend into the trachea. Fatal airway



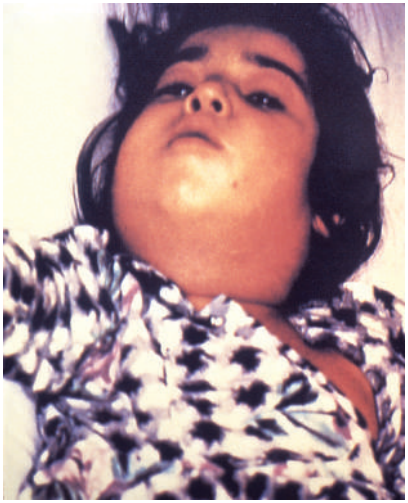
A diphtheria skin lesion on the leg.

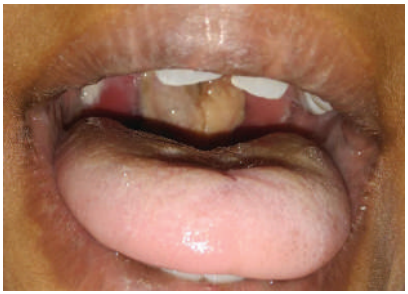
obstruction can result if the pseudomembrane extends into the larynx or trachea or if a piece of it becomes dislodged.
  * Accompanying inflammation of the cervical lymph nodes and surrounding soft tissue swelling of the neck give rise to "bull neck" appearance and is a sign of moderate to severe disease.

- Cutaneous diphtheria may present as a scaling rash or ulcers with clearly demarcated edges and membrane, but any chronic skin lesion may harbor C. diphtheriae along with other organisms. The systemic complications from cutaneous diphtheria with toxigenic strains appear to be less than from other sites.

Complications

- Exotoxin absorbed from the mucosal (or cutaneous) lesions may account for toxic damage to organs
- Most frequent complications are:
  * Myocarditis
  * Neuritis
  * Bulbar dysfunction
  * Oculomotor paralysis
  * Peripheral neuropathy
  * Pneumonia
  * Otitis media





Top: A diphtheria patient presented with a characteristic swollen neck or "bull neck".

Above: Dirty white pseudo-membrane classically seen in diphtheria.

Diagnosis

Presumptive Case Definition

Any person having illness of the upper respiratory tract with:
- Laryngitis or pharyngitis or tonsillitis

AND
- Adherent membranes of tonsils, pharynx and/or nose.

Confirmed Case Definition

A presumptive case with
- Isolation of Corynebacterium diphtheriae from a clinical specimen by culture, OR
- Detection by PCR from a clinical specimen

Note: Throat swab/pieces of membrane collection within 4 weeks of onset of sore throat.

Diphtheria Immunisation Scheme, London, England, 1941.

Treatment

- Respiratory Diphtheria is treated with the administration of a diphtheria antitoxin, administered intravenously or through an intramuscular injection. A single dose of 20,000-100,000 units should be administered as soon as a clinical diagnosis is made.
- Antibiotics are also given to eliminate the bacteria and toxin production, and to prevent transmission to others in all types of diphtheria.
- People with diphtheria cannot infect others, 48 hours after they start taking antibiotics. But, it is essential to complete the full course of the antibiotics.
- The antibiotics of choice are penicillin (0.6-1.2 gm 6-hourly) or erythromycin (0.5 gm 6-hourly) for 14 days after which two negative cultures from nose and throat should be obtained. Subsequently, the immunization protocol should be completed as per individual status.
- All close contacts must be identified, immunization status ascertained, given diphtheria booster appropriate for age, monitored for seven days and treated if disease develops. Asymptomatic unimmunized contacts should receive erythromycin for seven days or a single intramuscular dose of Benzathine penicillin if surveillance is not feasible. Immunization should be completed according to schedule.

Public Health Measures to be Taken

- Enhanced case-based surveillance & active case search
- Contact Tracing
- List of unimmunized/ unvaccinated children in the area
- Isolation and symptomatic management of cases
- Vaccination of susceptible as per GoI guidelines.

Post-exposure Prophylaxis for Diphtheria Contacts

Age	Immunization	Prophylaxis			
		Antibiotic	Dose	Route	Duration
<7 years old	Penta/DPT	Penicillian G Benzathine	6,00,000 units	IM	Single Dose
		or			
		Erythromycin	40 mg/kg in 4 divided doses	PO	7-10 days
>7 years old	Td	Penicillian G Benzathine	1.2 million units	IM	Single Dose
		or			
		Erythromycin	1 g/day in 4 divided doses	PO	7-10 days

Prevention

- The only effective way to prevent Diphtheria in children is to provide active immunization to all children.
- Pentavalent vaccine (DPT+ Hep B+ Hib vaccine) is recommended as three doses in Universal Immunization Program (UIP) given at 6, 10 and 14 weeks. Two booster doses of DPT are given: first booster at 16-24 months and second booster at 5-6 years of age. The dosage of the vaccine is 0.5 ml given intramuscular at the anterolateral aspect of left thigh.
- Any child with valid contraindication to pertussis component of DPT vaccine should be given paediatric DT vaccine.
- For adolescents and adults, the diphtheria toxoid is frequently combined with tetanus toxoid in lower concentration (Td vaccine).
- For unvaccinated individuals above 7 years of age, WHO recommends that Td combination vaccine can be administered in two doses, 1-2 months apart and a third dose after 6-12 months. Subsequent boosters should be administered at least one year apart for a total of 5 doses to obtain long-term protection.

Pentavalent vaccines is being administered under the Ministry of Health's Universal Immunisation Programme.

Outbreak Definitions

- For diphtheria, even a single laboratory confirmed case should trigger a public health response.
- Two temporally and geographically linked cases, of which at least one is laboratory confirmed, is considered an outbreak of diphtheria.

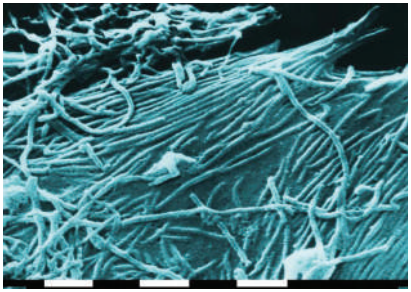
Laboratory Investigation for Confirmation

Type of Specimen	Timing of Collection	Storage & Transport	Test Performed
Throat swab or pieces of membrane	• Ideally as early as possible • Before starting antibiotics • Within 4 weeks from disease onset (sore throat)	• Use Amies transport media • Storage and transportation at 2-8° C	• Culture • PCR • Elek gel test

REFERENCES

1. https://www.who.int/news-room/fact-sheets/detail/measles
2. https://www.cdc.gov/diphtheria/index.html
3. https://www.nhp.gov.in/disease/respiratory/diphtheria
4. https://www.nhp.gov.in/universal-immunisation-programme_pg
5. Surveillance for Diphtheria, Pertussis and Neonatal Tetanus, MoHFW, GoI, 2020

Ebola



Scanning electron microscopic image of Ebola virions.

Ebola Virus Disease (EVD) (formerly known as Ebola Hemorrhagic Fever) is a severe, often fatal illness, with a death rate of up to 90%. The illness affects humans and nonhuman primates (monkeys, gorillas and chimpanzees).

The Ebolavirus genus is a member of the Filoviridae family. The virus family Filoviridae includes three genera: Cuevavirus, Marburgvirus, and Ebolavirus. Within the genus Ebolavirus, six species have been identified: Zaire (ZEBOV), Bundibugyo (BDBV), Sudan (SUDV), Taï Forest (TAFV), Reston (RESTV) and Bombali. Of these, only four are known to cause disease in people (Ebola, Sudan, Taï Forest, and Bundibugyo viruses).

Mode of Transmission

People can be infected with Ebola virus through direct contact (like touching) with:

- Blood or body fluids (urine, saliva, sweat, feces, vomit, breast milk, semen) of a person who is sick with or has died from EVD.
- Objects (such as clothes, bedding, needles, and syringes) contaminated with body fluids from a person sick with EVD or a body of a person who died from EVD.
- Blood or body fluids of infected fruit bats or nonhuman primates such as apes and monkeys.
- Semen from a man who recovered from EVD (through oral, vaginal, or anal sex) – up to 7 weeks post recovery from illness.

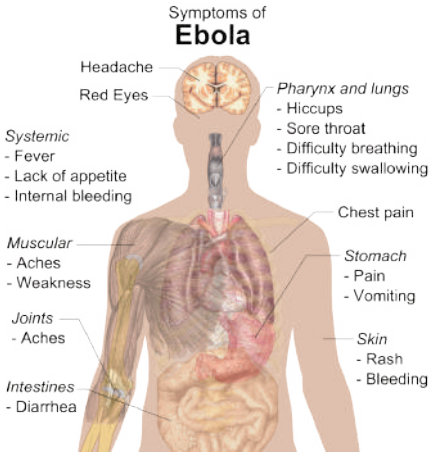
Who is at risk of infection?

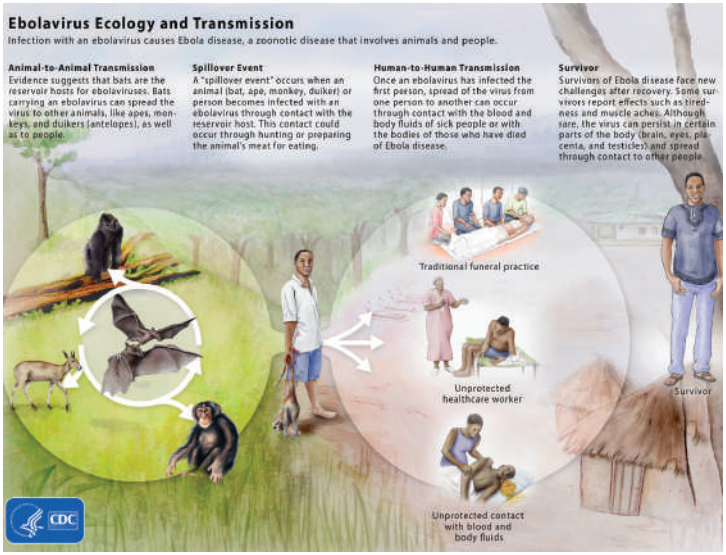
- **Healthcare providers**
- **Family, and friends who have come in close contact with EVD patients.**

Signs and Symptoms

Signs and symptoms of EVD include:

- Fever and Severe headache
- Fatigue
- Muscle pain
- Weakness
- Diarrhea
- Vomiting
- Stomach pain
- Unexplained bleeding or bruising rash
- Impaired kidney and liver function





Infection with an ebolavirus causes Ebola disease, a zoonotic disease that involves animals and humans.

- Laboratory findings include low white blood cell and platelet counts and elevated liver enzymes.

Complications

Hypovolemia, electrolyte abnormalities, hematologic abnormalities, refractory shock, hypoxia, hemorrhage, septic shock, multi-organ failure, and DIC.

Treatment

Supportive care – rehydration with oral or intravenous fluids – and treatment of specific symptoms and complications improves survival. Potential treatments including blood products, immune therapies and drug therapies are currently being evaluated.

Prevention

- While in an area affected by Ebola virus, you should avoid
  - Contact with blood and body fluids (such as urine, feces, saliva, sweat, vomit, breast milk, semen, and vaginal fluids).


Measuring Temperature at a road block in Lakka Sierra Leone.

* Items that may have come in contact with an infected person's blood or body fluids (such as clothes, bedding, needles, and medical equipment).
* Funeral or burial rituals that require handling the body of someone who died from EVD.
* Contact with bats and non-human primates or blood, fluids, and raw meat prepared from these animals (bushmeat) or meat from an unknown source.
* Contact with semen from a man who had EVD until you know the virus is gone from the semen.

- After returning from an area affected by Ebola virus, monitor your health for 21 days and seek medical care immediately if you develop symptoms of EVD.

Public Health Measures to be Taken

Early identification and systematic rapid isolation of cases under appropriate IPC measures, timely contact tracing, disinfection of infectious materials and the appropriate use of personal protective equipment.

- Healthcare workers who may be exposed to people with EVD should:
  * Wear appropriate personal protective equipment (PPE).
  * Practice proper infection control and sterilization measures.
  * Avoid direct contact with the bodies of people who have died from EVD.
  * Notify health officials if you have direct contact with blood or body fluids of a person sick with EVD.

Outbreak Definitions

Suspected Case

Any person ill or deceased who has or had fever with

- Acute clinical symptoms and signs of haemorrhage such as bleeding of the gums, nose-bleeds, conjunctival injection, red spots on the body, bloody stools and/or melena (black liquid stools), or vomiting blood (haematemesis)
- With a history of travel to the affected area.


Customers using the compulsory hands disinfection set-up (chlorinated water tank, basin) at a supermaket in Monrovia, Liberia, 2015.

A health worker incinerating materials used in the treatment of Ebola patients at Yambuku hospital in Zaire, 1976.

- Documented prior contact with an EBVD case is not required.

Presumptive Case

Any suspect case (living or dead) with a history of acute fever
- Who had contact with a clinical case of Ebola Haemorrhagic Fever, OR
- With three or more of the following Symptoms: Headache/vomiting/nausea/loss of appetite/diarrhea/intense fatigue/abdominal pain/general muscular or articular pain/difficulty in swallowing/difficulty in breathing/hiccups, OR
- Any unexplained death.

Confirmed Case

A presumptive case with
- Positive IgM antibody, OR
- Positive PCR, OR
- Viral isolation

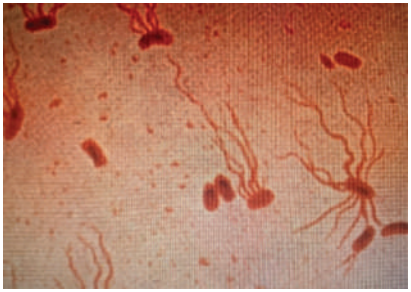
Laboratory Investigation for Confirmation

The Ebola virus is classified as a biosafety level four (BSL-4) pathogen and requires special containment and barrier protection measures for laboratory personnel, as well as for any people taking care of potentially infected patients or dead bodies.

REFERENCES

1. Home :: Integrated Disease Surveillance Programme (IDSP)
2. https://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease
3. https://www.cdc.gov/vhf/ebola/resources/pdfs/ebola-factsheet-p.pdf
4. https://www.cdc.gov/vhf/ebola/clinicians/evd/clinicians.html
5. https://main.mohfw.gov.in/diseasealerts/advisories-evd-ebola-virus-disease/ebola-virus-disease/ebola-virus
6. https://www.ecdc.europa.eu/en/infectious-disease-topics/z-disease-list/ebola-virus-disease/facts/factsheet-about-ebola-virus

Enteric Fever



A Salmonella Typhi Flagellar Stain.

Enteric fever (typhoid and paratyphoid fever) is caused by Salmonella enterica serovar Typhi (S. Typhi) and Salmonella enterica serovar Paratyphi (S. Paratyphi). S. Paratyphi A and B (and, uncommonly, S. Paratyphi C) cause a disease that is clinically indistinguishable from typhoid fever.

Mode of Transmission

Typhoid fever and paratyphoid fever are transmitted commonly through the consumption of drinking water or food contaminated with the feces of people who have typhoid fever or paratyphoid fever or of people who are chronic carriers of the responsible bacteria.

Who is at risk of infection?

Typhoid risk is higher in populations that lack access to safe water and adequate sanitation. Poor communities and vulnerable groups including children are at highest risk.

Signs and Symptoms

FIRST WEEK

- **Fever:** Exhibits a step-ladder pattern in 12% of cases, and in the rest, the fever has a steady insidious onset
- **Gastrointestinal manifestations:** Diffuse abdominal pain and tenderness; sometimes, fierce colicky pain in right upper quadrant. Monocytic infiltration in Peyer's patches, causing inflammation and narrowing of bowel lumen, resulting in constipation. Diarrhea, and not constipation, is common in young children in AIDS and one-third of immunocompetent adults
- Other symptoms:
  - Dry cough, Dull frontal headache, Delirium, Stupor, Malaise

SECOND WEEK

- Progression of above signs and symptoms, fever plateaus at 39-40°C
- **Rose spots:** Salmon-colored, blanching, maculopapules on the chest, abdomen, and back. It may not be visible in dark-skinned individuals. It is 1-4 cm in width, less than 5 in number, present in up to 25% of patients. They resolve within 2-5 days
- Abdominal distension, soft splenomegaly
- Relative bradycardia
- Dicrotic pulse – double beat, the second beat weaker than the first

THIRD WEEK

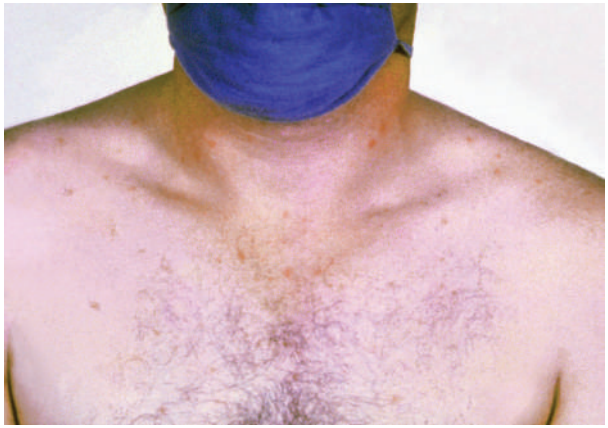
- Fever persists
- Increase in toxemia
- Anorexia
- Weight loss
- Conjunctivitis
- Thready pulse
- Tachypnea
- Crackles over lung bases
- Severe abdominal distension
- Sometimes, foul, green-yellow, liquid diarrhea (pea-soup diarrhea)
- Typhoid state – characterized by apathy, confusion, psychosis
- Bowel perforation and peritonitis due to necrosis in Peyer's patches
- Death may occur due to severe toxemia, myocarditis or intestinal hemorrhage

FOURTH WEEK

- Gradual improvement in fever, mental state, and abdominal distension over a few days
- Untreated patients may suffer from intestinal and neurological complications
- Weight loss and debilitating weakness (may last for months)
- Asymptomatic carrier state in some patients, who can transmit the bacteria indefinitely

ATYPICAL PRESENTATIONS

- Severe headaches mimicking meningitis
- Acute lobar pneumonia
- Arthralgias
- Urinary symptoms
- Severe jaundice
- Neurological symptoms such as delirium, Parkinsonian symptoms or Guillain-Barre syndrome
- Pancreatitis
- Meningitis
- Orchitis
- Osteomyelitis
- Abscesses



Rose colored spots on the chest of a man with typhoid fever, similar to those of paratyphoid.

Diagnosis

Suspected Case of Typhoid or Paratyphoid Fever

Fever for at least three out of seven consecutive days in an endemic area or following travel from an endemic area,
OR
Fever for at least three out of seven consecutive days within 28 days of being in household contact with a confirmed case of typhoid or paratyphoid fever.

Presumptive Case Definition

The acute illness characterized by persistent high fever with any of the following clinical features

- Headache, nausea, loss of appetite, toxic look
- Constipation or sometimes diarrhoea
- Splenomegaly

AND/OR

- Significant titre in widal test.

A Presumptive Case With

- Confirmed positive culture (blood, bone marrow, stool, urine)

OR

- Molecular methods of S. typhi/S paratyphi.

Treatment

Susceptibility	Patient	Antibiotic	Dosage
Quinolone sensitivity areas	Adult	**Responders:** Fluorominolones, namely Ciptoflosacin or Otlosacin OR 3rd Generation Cephalosporin like Cefixime **Nonresponders:** Chloramphenicol OR, Amoxicillin	15 mg/kg body weight/day x 10 days 15-20 mg/kg body weight/day x 10 days 50-75 mg/kg body weight/day x 14 days 75-100 mg/kg body weight/day x 14 days
	Child	**Responders:** 3rd Generation Cephalosporin like Cefixime **Nonresponders:** Chloramphenicol OR, Amoxicillin	15-20 mg/kg body weight/day x 10 days 50-75 mg/kg body weight x 14-21 days 75-100 mg/kg body weight x 14 days
Quinolone resistance areas	Adult	**Responders:** Cefixime **Nonresponders:** Azithromycin	20 mg/kg body weight/day x 14 days 10-20 mg/kg body weight/day x 7 days
	Child	**Responders:** Azithromycin **Nonresponders:** Cefixime	10-20 mg/kg body weight/day x 7 days 15-20 mg/kg body weight/day x 14 days

Dr. Schreiber administering a typhoid vaccination at a school in San Augustine County, Texas, USA in 1943.

Prevention

Health Education

- Drink water only from a safe source or water that has been disinfected (boiled or chlorinated).
- Cook food or reheat it thoroughly and eat it while it is still hot. Boil milk before drinking.
- Avoid ice creams from unreliable sources.
- Avoid uncooked food unless it can be peeled or shelled.
- Wash your hands after any contact with excreta and before preparing or eating food.
- Dispose of human excreta promptly and safely.
- Avoid ice from unreliable sources.

Immunization

List of available typhoid vaccines

Characteristics	Parenteral Killed Whole Cell Vaccine	Live Attenuated Ty21a	Vi Capsular Polysaccharide	Conjugated Typhoid Vaccine
Administration route	Parenteral	Oral	Parenteral	Parenteral
Dosing schedule	0.25 ml/dose for <10 yr 0.5 ml/ dose for ≥10 yr Two doses; two-four week apart	Four doses; one capsule each on alternate days	A single intramuscular injection of 0.5 ml	Two doses; four weeks apart

Public Health Measures to be Taken

- **Identify and maintain a line list of cases**
- **Health education activities to promote safe water drinking practices**
- **Regular water quality checks in the community**
- **Sanitation survey in the community.**

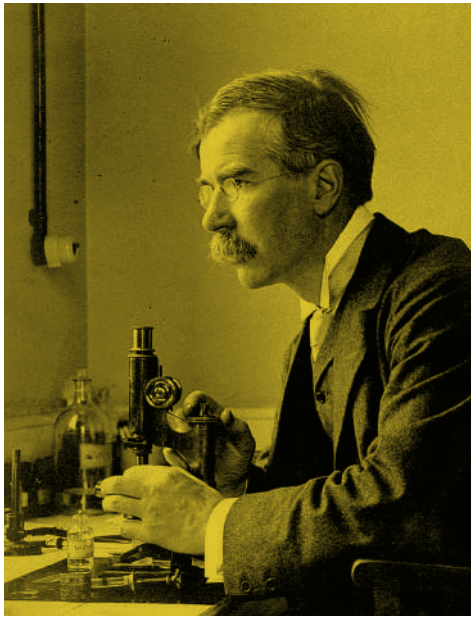
Outbreak Definitions

The definition of a suspected typhoid fever outbreak is an increase in the absolute number of cases occurring in a population over a defined time period, above what would normally be expected for the particular community, geographical area or season. A minimum of two cases confirmed by blood culture should be documented before an outbreak of typhoid fever is confirmed.

Laboratory Investigation for Confirmation

- **Culture and Sensitivity:** It is the gold standard and the most important investigation for diagnosis. Blood culture at 90% yield in first week and up to 40% in the fourth week of illness. Send paired cultures with total volume of blood to be sent as 5-10 ml with a blood: broth ratio of 1:5.
- Bone marrow culture is an important investigation in pyrexia of unknown origin (PUO) in later stages of the illness as it remains positive even after antibiotic therapy.
- Stool and urine cultures are not recommended due to poor yield.
- **Serology:** These tests are not diagnostic, may be supportive and should not be relied upon for patient management decisions.
  - **Widal Test:** It detects presence of immunoglobulin M (IgM) and IgG antibodies against H (flagellar antigen) and O (somatic antigen) of S. typhi and paratyphi A and B in the second week of illness. Tube method is better than the slide method. Antibody titer of both O and H in range of 1:160 dilution or more is taken as a positive test.
  - **Typhi Dot/Enzyme Immune Assay (EIA) Test:** It detects IgM and IgG antibodies against 50 kd outer membrane protein antigen which is specific for S. typhi. Specificity is only 37% and anamnestic reactions may be seen in other infections. A Cochrane database review in 2017 concluded that the rapid diagnostic serologic tests need further robust evaluation.

Vivotif - oral typhoid vaccine of live-attenuated S. enterica Typhi strain Ty21a.

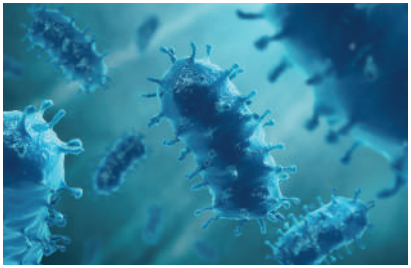


Almroth Edward Wright developed the first effective typhoid vaccine.

REFERENCES

1. https://ncdc.gov.in/
2. https://www.who.int/news-room/fact-sheets/detail/typhoid
3. https://www.cdc.gov/typhoid-fever/index.html
4. WHO Vaccine-Preventable Diseases Surveillance Standards, Typhoid
5. IAP Standard Treatment Guidelines 2022, Typhoid
6. API Recommendations for the Management of Typhoid Fever

Human Rabies



3D Rendering of the Rabies Virus.

Rabies is a vaccine-preventable, zoonotic, viral disease. Once clinical symptoms appear, rabies is virtually 100% fatal.

Mode of Transmission

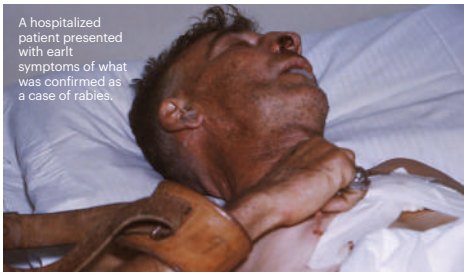
- People are usually infected following a bite or scratch from an animal with Rabies, and transmission to humans by rabid dogs' accounts for up to 99% of cases.
- It is also possible, but rare, for people to get Rabies from non-bite exposures, which can include scratches, abrasions, or open wounds that are exposed to saliva or other potentially infectious material from a rabid animal.
- Other types of contact, such as petting a rabid animal or contact with the blood, urine or faeces of a rabid animal, are not associated with risk for infection and are NOT considered to be exposures of concern for Rabies.
- Human-to-human transmission through bites or saliva is theoretically possible but has never been confirmed. The same applies to transmission to humans via the consumptions of raw meat or milk of infected animals.

Who is at Risk of Infection?

- **About 30-60% of reported rabies cases and deaths in India occur in children under the age of 15 years as bites that occur in children often go unrecognized and unreported.**

Signs and Symptoms

- The incubation period for rabies is typically 2-3 months but may vary from one week to one year, dependent upon factors such as the location of virus entry and viral load.
- Initial symptoms of rabies include a fever with pain and unusual or unexplained tingling, pricking, or burning sensation (paraesthesia) at the wound site. As the virus spreads to the central nervous system, progressive and fatal inflammation of the brain and spinal cord develops.
- There are two forms of the disease:
  - Furious rabies results in signs of hyperactivity, excitable behaviour, hydrophobia (fear of water) and sometimes aerophobia (fear of drafts or of fresh air). Death occurs after a few days due to cardio-respiratory arrest.
  - Paralytic rabies accounts for about 20% of the total number of human cases. This form of rabies runs a less dramatic and usually longer course than the furious form. Muscles gradually become paralysed, starting at the site of the



A hospitalized patient presented with earlt symptoms of what was confirmed as a case of rabies.

bite or scratch. A coma slowly develops, and eventually death occurs. The paralytic form of rabies is often misdiagnosed, contributing to the under-reporting of the disease.

Diagnosis

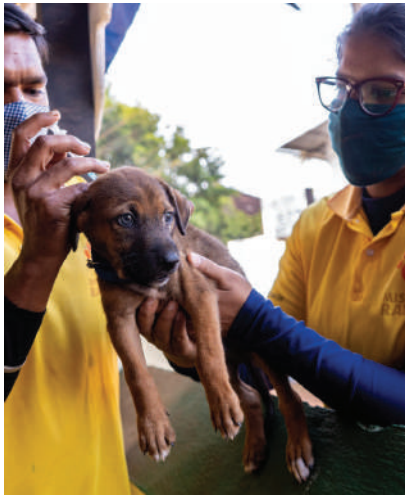
Presumptive Case Definition

A suspected human case plus history of exposure# to a (suspect*/probable€) rabid animal

Exposure is usually defined as a bite or scratch from a rabies-susceptible animal (usually dogs). It could also be lick exposure to open wound, abrasion, mucous membranes of the patient.

* A suspect rabid animal is a rabies-susceptible animal (usually dogs) which presents with any of the following signs at time of exposure or within 10 days following exposure: unprovoked aggression (biting people or animals or inanimate objects), hyper salivation, paralysis, lethargy, abnormal vocalization, or diurnal activity of nocturnal species. Whenever the history of mentioned signs cannot be elicited, the history of exposure to rabies-susceptible animal would be considered adequate.

€ A probable rabid animal is a suspect rabid animal (as defined above) with additional history of a bite by another suspect/probable rabid animal and/or is a suspect rabid animal that is killed, died, or disappeared within 4-5 days of observing illness signs.



Top: Canine vaccination by Mission Rabies workers in Goa.

Above: Two dogs with dumb rabies.

Laboratory Confirmed Case Definition

A suspect or a probable human case that is laboratory-confirmed.
Laboratory confirmation by one or more of the following:

- Detection of rabies viral antigens by direct fluorescent antibody test (FAT) or by ELISA in clinical specimens, preferably brain tissue (collected post mortem).
- Detection by FAT on skin biopsy (ante mortem).
- FAT positive after inoculation of brain tissue, saliva or CSF in cell culture, or after intracerebral inoculation in mice or in suckling mice.
- Detectable rabies-neutralizing antibody titre in the serum or the CSF of an unvaccinated person.
- Detection of viral nucleic acids by PCR on tissue collected post mortem or intra vitam in a clinical specimen (brain tissue or skin, cornea, urine or saliva).

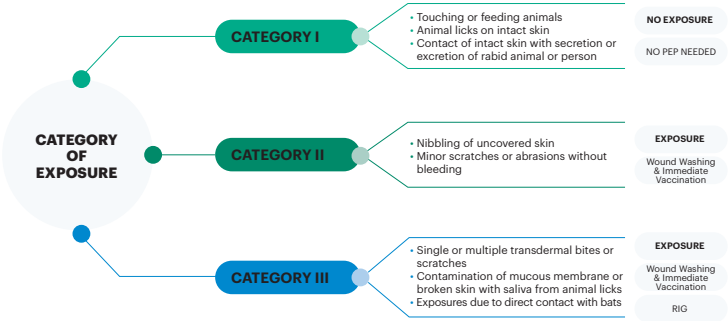
Commemorative stamp depicting Dr. Joseph Lennox Pavan isolating the rabies virus.

Public Health Measures to be Taken

- **Mass vaccination is a proven, cost–effective way to save human lives by stopping transmission of rabies at its source.**
- **After exposure of people to a potentially rabid animal, they should seek post-exposure prophylaxis (PEP), which consists of immediate, thorough wound washing.**

Treatment

Decision Tree for Post-exposure Prophylaxis



N.B. Bite by wild animals and bites in forest areas should be considered as category III exposure and treated accordingly.

Post Exposure Prophylaxis

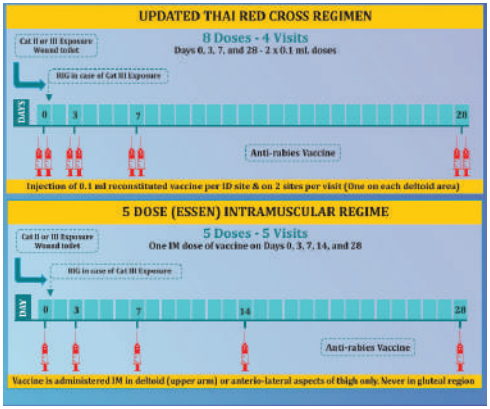
Management of Animal Bite Wounds

- **Wound toilet:** Immediate thorough flushing and washing of all wounds with soap and water for at least 15 minutes and application of povidone iodine or antiseptic having virucidal activity. A bleeding wound indicates severe exposure and should be infiltrated with RIG.
- **Suturing of wounds:** In case where suturing cannot be avoided, the wound needs to be infiltrated with RIG after thorough cleaning. The suturing should be delayed for several hours before minimal suturing is done.
- **Tetanus and antibiotics prophylaxis:** Tetanus prophylaxis should be done as per national guidelines. To prevent sepsis in the wounds, a suitable antibiotic may be prescribed.
- Counselling of the victim.

Passive Immunization with Rabies Immunoglobulin (RIG)

- **Indications**
  - Category III exposures
  - Category II exposures in immunocompromised patient
- **Types and Dose**
  - Equine RIG: 40 IU/KBW
  - Human RIG: 20 IU/KBW

- **Administration**
  - Should be brought to room temperature before administering.
  - Administered as soon as possible and the entire dose injected as close as possible to the wound.
  - Not indicated beyond the seventh day after the first dose of rabies vaccine.
  - It should never be administered in the same syringe or at the same anatomical site where the vaccine was administered.
  - It must never be given intravenously.
  - Anaphylactic reactions are rare.



Active Immunization with Anti-rabies Vaccine

- **Indications**
  - Category II exposures
  - Category III exposures

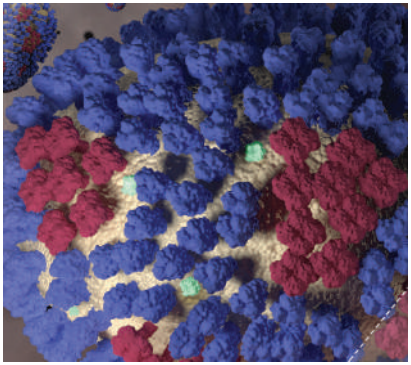
Type of Prophylaxis	Route of Administration	Dose of Vaccine	Day of Dose	No. of Injections	Total No. of Per Visit	Site of Injection Visits
Post Exposure Prophylaxis	Intra Dermal	0.1 ml per dose	Day 0, 3, 7 and 28	2	4	Adults **Deltoid Muscle** Infants and Small Children **Anterolateral Thigh**
	Intra Muscular	1 entire vaccine vial	Day 0, 3, 7, 14 and 28	1	5	
Pre Exposure Prophylaxis	Intra Dermal	0.1 ml per dose	Day 0, 7 and booster on either day 21 or 28	1	3	
	Intra Muscular	1 entire vaccine vial	Day 0, 7 and booster on either day 21 or 28	1	3	
Re-exposure	Intra Dermal	0.1 ml per dose	Day 0 and 3	1	2	
	Intra Muscular	1 entire vaccine vial	Day 0 and 3	1	2	

N.B. In re-exposure cases if the patient cannot document previous pre or post exposure treatment, they should be treated as immunologically naïve case.

REFERENCES

1. https://www.cdc.gov/rabies
2. https://www.who.int/news-room/fact-sheets/detail/rabies
3. https://ncdc.gov.in/
4. National Action Plan for Dog Mediated Rabies Elimination from India by 2030, NCDC, MoHFW
5. National Guidelines for Rabies Prophylaxis, 2019, NCDC
6. https://www.nhp.gov.in/disease/neurological/rabies

Influenza



Influenza Virus.

Seasonal Influenza is a preventable infectious disease, mainly involving respiratory symptoms. It is caused by influenza virus which is moderately infectious. It predominantly spreads via droplets and contacts, or indirectly via respiratory secretions on hands, tissues, etc.

There are four types of seasonal influenza viruses, types A, B, C and D. Influenza A and B viruses circulate and cause seasonal epidemics of disease.

- Influenza A viruses are further classified into subtypes according to the combinations of the hemagglutinin (HA) and the neuraminidase (NA), the proteins on the surface of the virus. Currently circulating in humans are subtype A (H1N1) and A (H3N2) influenza viruses.

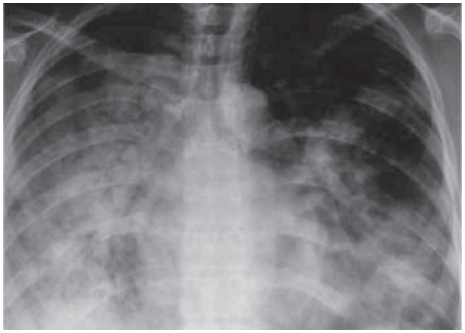
The A (H1N1) is also written as A (H1N1) pdm09 as it caused the pandemic in 2009 and subsequently replaced the seasonal influenza A (H1N1) virus which had circulated prior to 2009. Only influenza type A viruses are known to have caused pandemics.

- Influenza B viruses are not classified into subtypes, but can be broken down into lineages. Currently circulating influenza type B viruses belong to either B/Yamagata or B/Victoria lineage.
- Influenza C virus is detected less frequently and usually causes mild infections, thus does not present public health importance.
- Influenza D viruses primarily affect cattle and are not known to infect or cause illness in humans.

Who is at Risk of Infection?

- **Children aged <5 years especially <2 years of age, old age; Pregnant mothers, Health workers,**
- **Persons with Co-morbid conditions, Immuno-compromised; long term steroid therapy treatment.**

Influenza like illnesses are defined by WHO as an acute respiratory illness with fever ≥ 38°C and cough onset within the last ten days. Such influenza-like-illness can occur due to infection of respiratory viruses such as influenza viruses, rhinovirus, respiratory syncytial virus, parainfluenza, adenovirus.



Chest X-ray of a patient diagnosed with H1N1, showing bilateral ground-glass opacities.

SARI (Severe Acute Respiratory infection) is defined as

Any person with:

- An acute respiratory infection (sudden cough and sore throat) with measured fever of ≥ 38°C (≥ 100.4°F); with onset within the last 10 days, AND
- Requires hospitalization

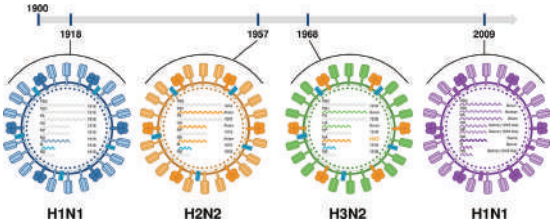
Mode of Transmission

- Droplets from infected human beings
- Direct contact/contact with fomites
- Incubation period: 1-2 days.

A doctor administering an influenza vaccine to a health worker.

Signs and Symptoms

- Fever
- Cough
- Sore throat
- Body ache
- Head aches
- Fatigue
- Breathlessness



There have been four influenza pandemics since the turn of the 20th century, occurring in 1918 (H1N1), 1957 (H2N2), 1968 (H3N2), and 2009 (H1N1). This timeline shows the temporal and genetic reassortment relationships among each of the pandemic influenza subtypes.

Complications

Bacterial pneumonia, ear infections, sinus infections and worsening of chronic medical conditions, such as congestive heart failure, asthma, or diabetes.

Diagnosis

Presumptive Case Definition

Any person with an acute respiratory infection (sudden cough and sore throat) with measured fever of ≥ 38°C
(≥ 100.4°F); with onset within the last ten days.

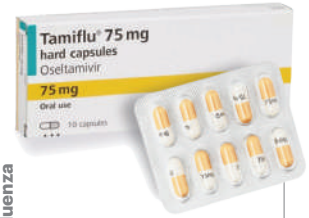
Laboratory Confirmed Case Definition

A presumptive case of ILI or SARI with

- Conventional PCR or real-time reverse transcription PCR (RT-PCR)

OR

- Any validated nucleic acid-based test.



Oseltamivir, sold under the brand name Tamiflu, for prevention of influenza A and influenza B, viruses that cause the flu.

Treatment

The basic principles of treatment are:

- Early implementation of infection control precautions to minimize nosocomial/household spread of disease through frequent hand wash, social distancing.
- Prompt treatment to prevent severe illness and death.
- Early identification and follow up of persons at risk.

Oseltamivir is the recommended drug for treatment.

Weight-based dosage for Oseltamivir

Weight	Age	Dosage
<15 kgs	1-5 years	30 mg BD for 5 days
15-23 kgs	5-8 years	45 mg BD for 5 days
24-<40 kgs	8-12 years	60 mg BD for 5 days
>40 kgs	More than 12 years	75 mg BD for 5 days

Infants (< one year)	
< 3 months*	12 mg BD for 5 days
3-5 months	20 mg BD for 5 days
6-11 months	25 mg BD for 5 days

*in pre-term infants the dose may be modified from 1-3mg/kg/dose BD Oseltamivir is also available as syrup (6-12 mg per ml). If needed dose and duration can be modified as per clinical condition.

Public Health Measures to be Taken

- **Disease specific surveillance**
- **Personal hygiene and respiratory etiquette**
- **Quarantine/ isolation of cases**
- **Vaccination as per GoI guidelines.**

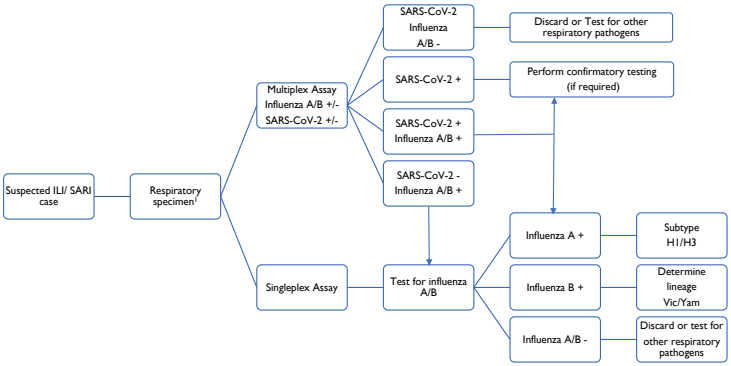
Prevention

Ministry of Health and Family Welfare recommends the trivalent inactivated influenza vaccine. Government of India recommends vaccination of high-risk groups with Seasonal Influenza vaccine. The recommendations for prioritized groups are broadly categorized as under:

- Health Care workers, working in hospital/institutional settings (doctors, nurses, paramedics) with probability of exposure to Influenza virus.

Professional examining a laboratory-grown reconstruction of the 1918 Spanish flu virus in a biosafety level 3 environment.

Testing algorithm for Influenza A and B virus



1 Nasal swabs, throat swabs, combined nasal and throat swabs, nasopharyngeal aspirates are suitable clinical specimens for the detection of both influenza viruses and SARS-CoV-2 in clinical specimens

- Pregnant women, irrespective of the duration of pregnancy.
- Persons with chronic illnesses such as Chronic Obstructive Pulmonary Disease, Bronchial Asthma, heart disease, liver disease, kidney disease, blood disorders, diabetes, cancer and those who are immunocompromised.
- Children having chronic diseases like Asthma; neuro developmental condition like cerebral palsy, epilepsy stroke, mentally challenged; heart disease like CHI, CHF; blood disorders like sickle cell disease; diabetes, metabolic disorder, all immunocompromised children, malignancy receiving immuno-suppressive therapy, kidney disorder and liver disorder.
- Vaccine advisable for elderly individuals (≥ 65 years of age) and children between six months to eight years of age.

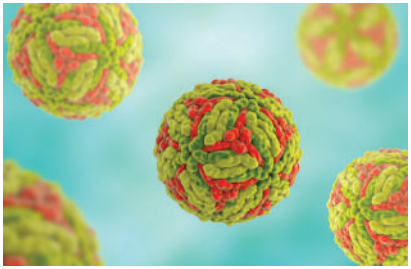
Type of specimen	Test	Volume	Mode of collection	Transportation
Throat Swab	RT-PCR	-	Throat Swab in VTM	In cold chain (2-8°C)

Top: A 1918 Influenza Poster — Prevent disease. Careless spitting, coughing, sneezing, spread influenza and tuberculosis.

REFERENCES

1. Home :: Integrated Disease Surveillance Programme(IDSP)
2. https://ncdc.gov.in/
3. https://www.who.int/news-room/fact-sheets/detail/influenza-(seasonal)
4. https://www.cdc.gov/flu/about/keyfacts.htm
5. https://main.mohfw.gov.in/sites/default/files/30580390001493710612.pdf

Japanese Encephalitis



Japanese encephalitis virus, 3D illustration.

Japanese encephalitis (JE) is a mosquito borne zoonotic viral disease, caused by Japanese Encephalitis virus (JEV).

Mode of Transmission

JE virus 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 (cattle egrets, pond herons etc.). Humans are incidental or dead-end hosts.

Signs and Symptoms

- Most JEV infections are mild (fever and headache) or without apparent symptoms
- The incubation period is between 4-14 days
- In children, gastrointestinal pain and vomiting may be the dominant initial symptoms
- Approximately one in 250 infections results in severe clinical illness. Severe disease is characterized by rapid onset of high fever, headache, neck stiffness, disorientation, coma, seizures, spastic paralysis and ultimately death. The case-fatality rate can be as high as 30% among those with disease symptoms.
- Of those who survive, 20-30% suffer permanent intellectual, behavioral or neurological sequelae such as paralysis, recurrent seizures or the inability to speak.

Risk Factors for JE Transmission

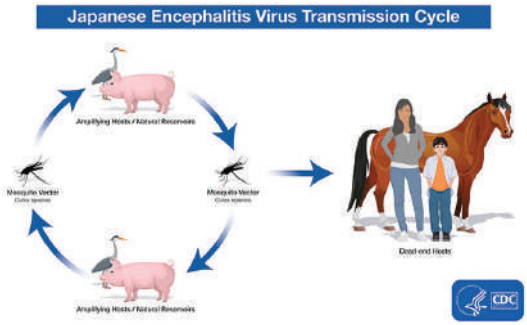
- **Children under 15 years of age.**
- **Peak season is May to November in India.**
- **People living near paddy fields/areas of water stagnation and pig farms.**

Diagnosis

Presumptive Case Definition

A person of any age, at any time of year with:

- Acute onset of fever not more than five-seven days duration, associated with Change in mental status (may include irritability, somnolence or abnormal behaviour greater than that seen with usual febrile illness). And/or
- New onset of seizures (excluding simple febrile seizures).



- In an epidemic situation, fever with altered sensorium persisting for more than two hours with a focal seizure or paralysis of any part of body is encephalitis.

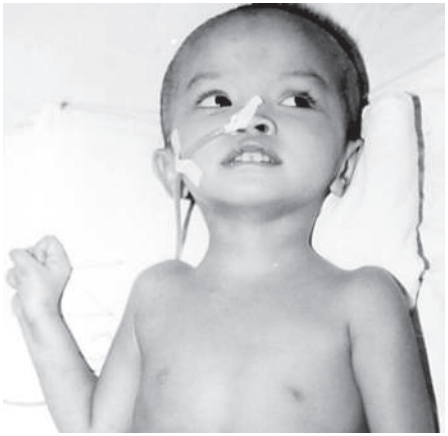
Laboratory Confirmed Case Definition

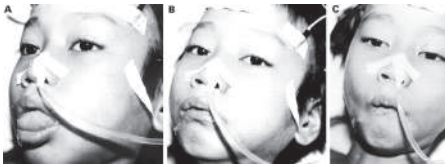
Every AES is a Suspect case of JE and it has to be laboratory confirmed with any one of the following markers:

- Presence of IgM antibody in serum and/ or CSF to JE Virus
- Fourfold difference in IgM antibody titre in paired sera
- Virus isolation from brain tissue
- Antigen detection by immunofluroscence
- Nucleic acid detection by PCR

Treatment

- There is no antiviral treatment for patients with JE. Management of JE is essentially symptomatic.
  - Position of the Patient-head on side
  - Nothing to be given orally
  - Management of Airway and Breathing
  - Management of Circulation
  - Management of Convulsions
  - Treat Fever and Raised ICT





Top: Fixed flexion of the upper limb: a common sequelae in Japanese encephalitis.

Above: Facial grimacing in a Vietnamese boy with Japanese encephalitis.

- At the health facility it is important to exclude other causes of CNS affliction like meningitis or cerebral malaria which require specific treatment.

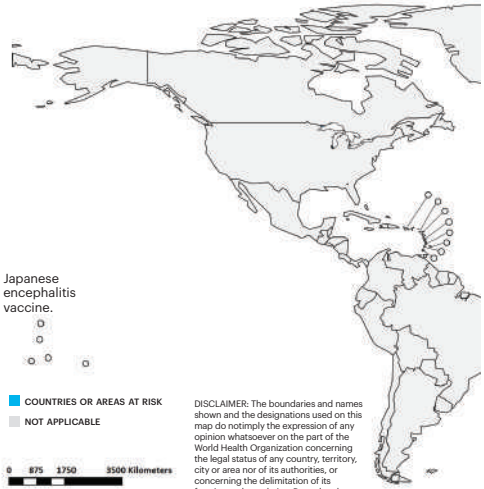
- Refer the patient with following conditions to a higher center:
  - Severe Respiratory Distress
  - Uncontrolled seizure
  - Deteriorating level of consciousness
  - Shock and not responding to fluid/refractory shock
  - Bleeding Manifestations

Prevention

- **Vaccination:** Safe and effective JE vaccines are available to prevent disease. Vaccination of children (<15 years) is done in JE endemic areas. It is given in two doses: first dose is given at nine completed months to 12 months of age and second dose at 16-24 months of age.

A child infected with encephalitis being treated at Gorakhpur's BRD Medical College.

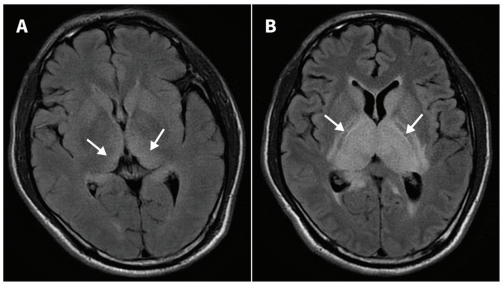
Japanese encephalitis vaccine.



DISCLAIMER: The boundaries and names shown and the designations used on this map do notimply 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 nor of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Public Health Measures to be Taken

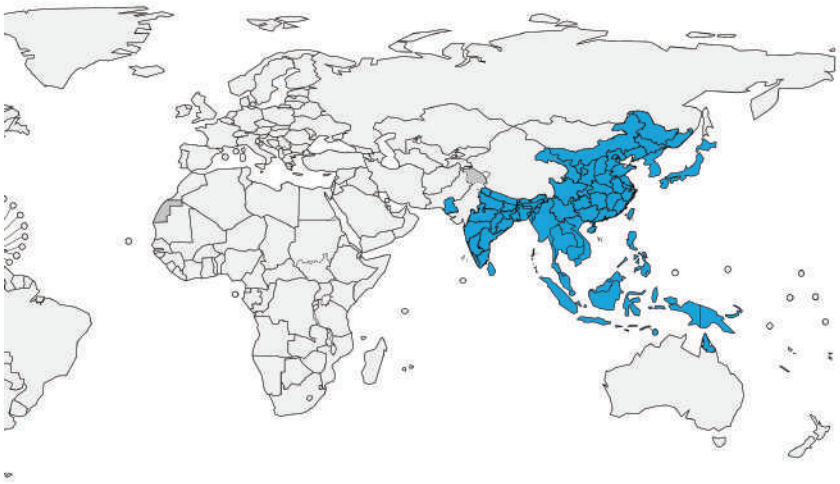
- Enhanced case-based surveillance and active case search
- Contact Tracing
- List of unimmunized /unvaccinated children in the area
- Isolation and symptomatic management of cases
- Vaccination of susceptible as per GoI guidelines.



(A) Brain MRI scan with fluid-attenuated inversion recovery (FLAIR) sequence on day 1 showing mildly high signal intensities in the bilateral thalami (arrows) in a 52 year-old man with Japanese encephalitis.

(B) Brain MRI with FLAIR sequence on day 5 showing markedly high signal intensities in the bilateral thalami (arrows), caudate nuclei and internal capsules.

Japanese Encephalitis: Countries or Areas at Risk



Culex mosquitos transmit Japanese encephalitis to humans.

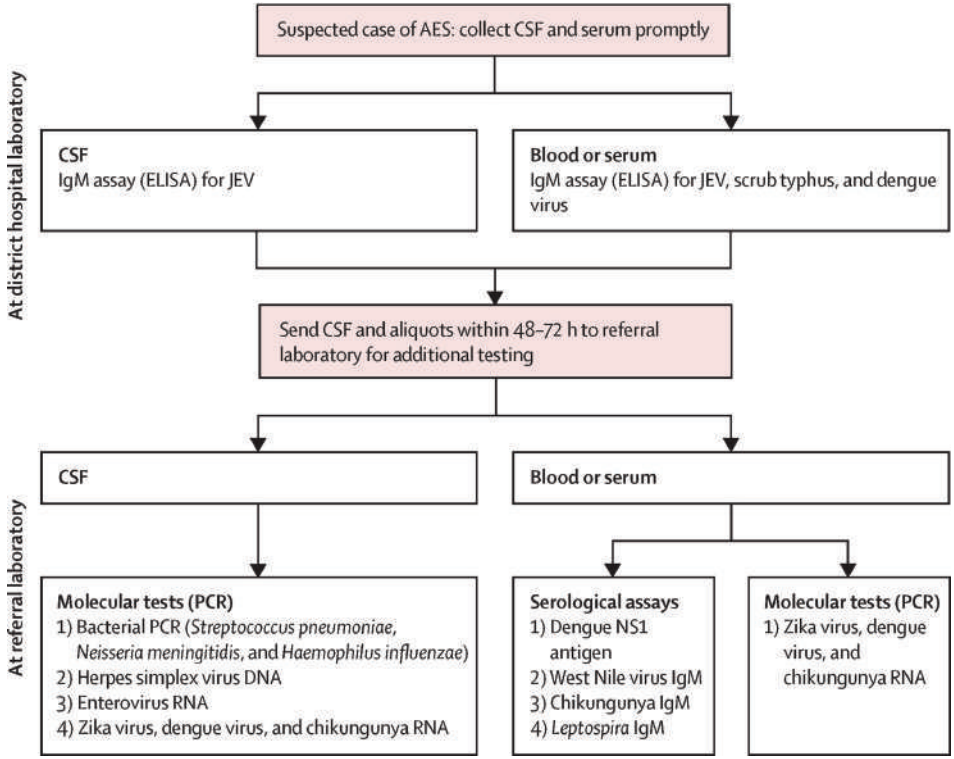
- **Personal protection against mosquito bites:**
  - Use insect repellent.
  - Wear proper clothing to reduce mosquito bites (wear long-sleeves, long pants and socks when outdoors).
  - Reduce exposure to mosquitoes during peak biting hours (cooler hours from dusk to dawn).
  - Use of insecticide treated mosquito nets.

- Piggeries may be kept away (4-5 kms) from human dwellings.

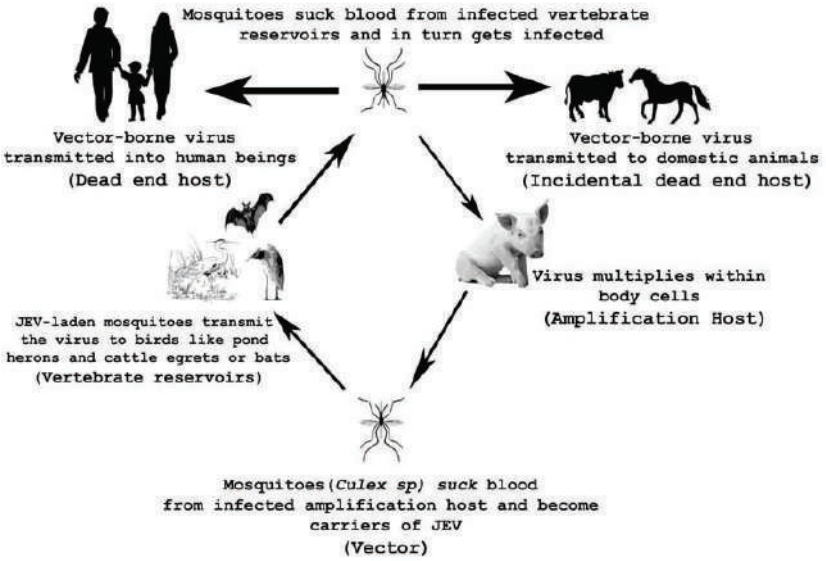
Laboratory Investigations for Confirmation

Blood (serum) and cerebrospinal fluid (CSF). Blood samples should be collected from suspected JE cases within four days after the onset of illness for isolation of virus and at least five days after the onset of illness for detection of IgM antibodies. A second, convalescent samples should be collected at least ten - 14 days after the first sample for serology.

Diagnostic algorithm for acute encephalitis syndrome



Source: Ravi, Vasanthapuram, et al. "An algorithmic approach to identifying the aetiology of acute encephalitis syndrome in India: results of a 4-year enhanced surveillance study." The Lancet Global Health 10.5 (2022): e685-e693

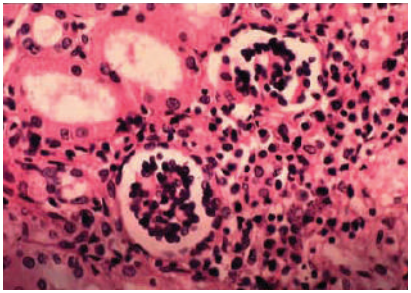


Enzootic transmission cycle of Japanese encephalitis virus. The virus is transmitted to vertebrate hosts by mosquitoes belonging to the Culex sp. Pigs serve as amplification hosts and forms a critical link in the transmission cycle. Ardeid water birds and bats serve as virus reservoirs. Humans are dead end hosts as the virus cannot be transmitted from an infected person to another.

REFERENCES

1. National Center for Vector Borne Diseases Control (NCVBDC) (nvbdcp.gov.in)
2. Japanese encephalitis (who.int)
3. Japanese Encephalitis | Japanese Encephalitis | CDC
4. National Programme for Prevention & Control of JE/AES (NPPCJA)
5. Revised Treatment Guidelines of AES including JE (2009)
6. Guidelines for Surveillance of Acute Encephalitis Syndrome
7. Guidelines on clinical Management of Japanese Encephalitis
8. Dutta, Kallol et al. "Chemotherapy in Japanese encephalitis: are we there yet?." Infectious disorders drug targets vol. 11,3 (2011): 300-14. doi:10.2174/187152611795768051

Kala-Azar



Amastigote form of Leishmania Donovani in a chorionic villus.

Kala Azar or Visceral Leishmaniasis is a parasitic disease caused by Leishmania donovani and transmitted by the sandfly Phlebotomus argentipes.

Mode of Transmission

Indian Kala-Azar has a unique epidemiological feature of being anthroponotic; human is the only known reservoir of infection.

Female sandflies pick up parasite (Amastigote or LD bodies) while feeding on an infected human host. Parasite undergo morphological change to become flagellate (Promastigote or Leptomonad), development and multiplication in the gut of sandflies and move to mouthparts. Healthy human hosts get infection when an infective sandfly vector bites them.

Disease transmission is highest in the rainy season. The vector breeds in humid soil rich in organic matter and near cattle sheds and mud- houses. It rests most commonly in cracks and crevices of thatched mud-houses. The peak biting time of the vector is around midnight.

What is Post Kala-Azar Dermal Leishmaniasis (PKDL)?

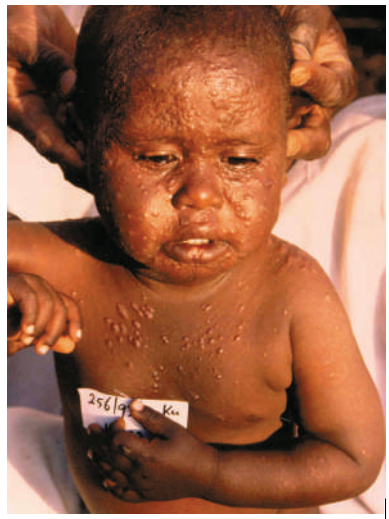
Post Kala-Azar Dermal Leishmaniasis is a condition in which Leishmania donovani parasites are found in skin. PKDL develops in some of the Indian Kala-Azar patients usually 1-2 years or more following recovery of Kala-Azar.

Signs and Symptoms

Being a chronic disease, the incubation period of Kala-Azar varies significantly. In India it ranges from 4 months to 1 year.

The clinical features include:

- Recurrent fever intermittent or remittent with often double rise of more than two weeks.
- Loss of appetite, pallor and weight loss with progressive emaciation and weakness.



PKDL nodular lesions that are confluent with plaque formation.

Risk Factors for Disease Transmission

- **Poor socio-economic conditions**
- **Migration of people**
- **Climate change**
- **Urbanization and deforestation.**

- Spleen enlarges rapidly to massive enlargement, usually soft and nontender.
- Liver enlargement, not to the extent of spleen, usually soft, smooth surface with sharp edge.
- Lymphadenopathy.
- Skin becomes dry, thin and scaly and loss of hair. Light colored persons show grayish discoloration of the skin of hands, feet, abdomen and face which gives the Indian name Kala-Azar meaning “Black fever”.
- Anaemia.
- PKDL manifests in the form of hypo pigmentation or erythematous macules on any part of the body which may later become papular or nodular and infiltrative especially on the face.

Blood-fed Lutzomyia longipalpis sandfly.

Complications

- Kala-Azar if not treated, may lead to death in 95% of patients.
- HIV infection increases the severity of the disease, heightening people’s risk of dying from visceral leishmaniasis.

Diagnosis

Presumptive Case Definition

A person with history of fever for more than two weeks with splenomegaly and hepatomegaly not responding to antimalarial and antibiotics in a patient from Kala azar endemic area.

Confirmed Case of Kala Azar

A 'suspect' Kala azar patient found positive on screening with rapid diagnostic test.
OR
In cases with past history of Kala-azar or in those with high suspicion of kala azar with negative RDT test result but found positive by bone marrow/spleen aspirate for LD bodies.

Probable PKDL

A patient living in or having travelled to Kala-Azar endemic areas presenting with a typically symmetrical multiple hypopigmented macules, papules, plaques, or nodules without loss of sensation.


Indoor residual spraying for vector control in a high Kala-Azar endemic village.

Confirmed PKDL

A probable PKDL case confirmed parasitologically by PCR or a slit-skin smear or biopsy.

Treatment

- Liposomal Amphotericin B (LAMB) in a single dose of 10 mg/kg intravenous infusion over two hours is the first-choice treatment regimen for the Indian subcontinent within the current elimination strategy.
- Miltefosine can also be used.
  - 100 mg daily as one capsule (50 mg) in the morning and one capsule (50 mg) in the evening, after meals for 28 days.
  - Adults (>12 years) weighing (less than 25 kg): 50 mg miltefosine daily as one capsule (50 mg) in the morning, after meals for 28 days.
  - Children (2-11 years) – 2.5 mg/kg once daily after meals for 28 days
  - The drug is not to be used in the case of children below 2 years of age and pregnant women/women who refuse contraception during treatment with Miltefosine.
- Amphotericin B injection deoxycholate injection 1 mg/kg on alternate days for 15 doses can also be used through intravenous infusion in 5% dextrose after mixing the drug in water for injection, very slowly in 6-8 hours. The treatment of the patients should be under strict supervision and only on indoor basis.
- The combination regimen (Injection Paromomycin-Miltefosine) is also recommended.
  - Miltefosine given orally for 10 days at 100 mg daily for adults over 25 kg, 50 mg daily for adults under 25 kg and 2.5 mg/kg daily for children.
  - Paromomycin 11 mg/kg base given intramuscularly for 10 days.
- PKDL patients are to be treated with
  - **Liposomal Amphotericin B:** 5 mg/kg/day by infusion 2 times per week for 3 weeks for a total dose of 30 mg/kg, or
  - **Miltefosine:** 100 mg orally per day for 12 weeks, or
  - **Amphotericin B Deoxycholate:** 1 mg/kg over 4 months, 60-80 doses.

Prevention

- Insecticidal Residual Spray (IRS)
  - The current strategy is to do IRS twice a year in all houses (upto 6 feet height) and complete coverage of cattle sheds in villages which reported Kala-Azar case

Public Health Measures to be Taken

- **Fever survey and maintain a line list of cases**
- **Symptomatic management of cases**
- **Entomological Assessment and Integrated Vector Control Measures**
- **Awareness generation in the community.**

in the last 3 years including the current year. This should be supplemented with focused IRS in villages reporting KA cases.
  - The spray is usually organized in two rounds, first round during February-March when sandflies are fairly active. Second round during May-June (months may vary from district-to-district based on entomological data) to limit sand fly population supplemented with focused IRS in KA reporting villages.
  - Alpha-cypermethrin 5% wettable powder formulation is currently applied for indoor residual spraying in India. It kills the sandflies that land on sprayed wall surfaces.
- Personal protection to prevent human vector contact by use of ITMN/LLIN.
- Microenvironment management (Pucca houses and living conditions).
- Environmental code of practices (ECoP) to reduce sand fly to breed in conducive atmosphere, ECoP documents are available in NVBDCP website.

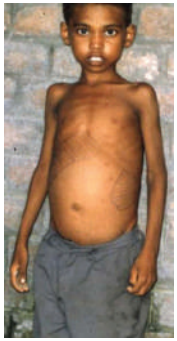
Operational Definition of Outbreak

Based on epidemiology situation of disease in India, following operational criteria has been proposed to initiate outbreak investigations.

- **Endemic States (Bihar, Jharkhand, West Bengal and Uttar Pradesh):** Ten or more laboratory confirmed cases reported in a given area (cluster/hamlet/village) or among a specific group of people within six months of occurrence of index case.
- **In Low Endemic States (Uttar Pradesh and West Bengal):** Five or more laboratory confirmed cases warrants for an outbreak investigation.
- **Non-endemic States/Districts/Blocks of an Endemic State:** Occurrence of even a single laboratory confirmed case reported in a cluster/hamlet/village amounts for KA outbreak.

Laboratory investigation for confirmation

- **Serology Tests:** The most commonly used tests based on relative sensitivity; specificity and operationally feasibility include Direct Agglutination Test (DAT), rapid test dipstick and ELISA. However, all these tests detect IgG antibodies that are relatively long lasting. IgM detecting tests are under development and not available for field use.
- **Parasite Demonstration:** Confirmatory diagnosis is through bone marrow/spleen/ lymph node aspiration or in culture medium is the confirmatory diagnosis. However, sensitivity varies with the organ selected for aspiration. Though spleen aspiration has the highest sensitivity and specificity (considered gold standard) but a skilled professional with appropriate precautions can perform it only at a good hospital facility.

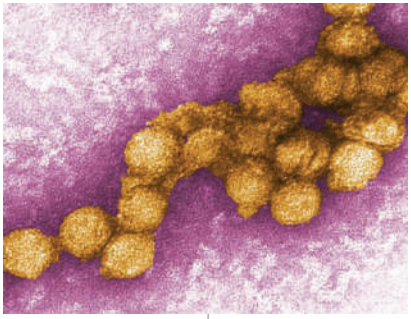


Anaemia with emaciation and gross splenomegaly produces a typical appearance of the patients.

REFERENCES

1. https://nvbdcp.gov.in/
2. https://www.nhp.gov.in/disease/kala-azar-leishmaniasis
3. Operational Guidelines on Kala-azar Elimination – 2015, NVBDCP
4. WHO guidelines on diagnosis and management of PKDL, 2012
5. Accelerated Plan for Kala Azar, 2017, NVBDCP, MoHFW
6. Operational definitions in kala-azar elimination programme, 2021, NVBDCP, MoHFW

Kyasanur Forest Disease



Kyasanur Forest Disease (KFD) is a re-emerging zoonotic disease associated with sudden onset of high-grade fever, prostration, nausea, vomiting, diarrhea and occasionally neurological & haemorrhagic manifestations. The KFD virus is a member of the genus flavivirus and family Flaviviridae. Hard ticks (Hemaphysalis spinigera) are the reservoir of KFD virus and once infected, remain so for life. Rodents, shrews, and monkeys are common hosts for KFDV after being bitten by an infected tick. KFDV can cause epizootics with high fatality in primates.

Mode of Transmission

- KFDV is transmitted by the bite of an infected tick, especially nymphal stage ticks.
- Incubation period is approximately three-eight days after bite of an infective tick.

The Flaviviridae are a family of positive, single-stranded, enveloped RNA viruses.

Who is at Risk of Infection?

- **People with recreational or occupational exposure to rural or outdoor settings (e.g., hunters, herders, forest workers, farmers) are potentially at risk for infection by contact with infected ticks.**
- **More cases are reported during the dry season, from Nov. through June.**

Signs and Symptoms

Sudden onset of chills, fever, and headache. Severe muscle pain with vomiting, gastrointestinal symptoms and bleeding problems may occur three-four days after initial symptom onset. Patients may experience abnormally low blood pressure, and low platelet, red blood cell, and white blood cell counts.

Complications

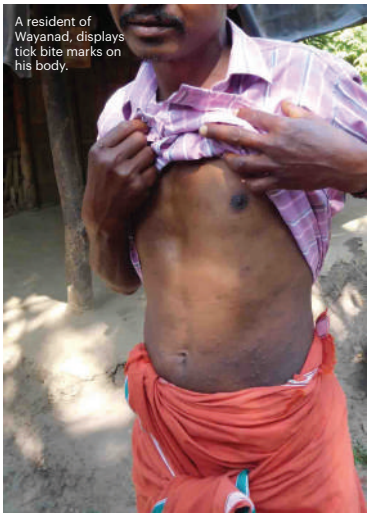
In severe cases, neurological symptoms like neck stiffness, mental disturbance, coarse tremors, giddiness, and abnormality of reflexes have been observed. Un-treated cases rapidly progress to convulsions, coma and death.

Diagnosis

Presumptive Case Definition

A patient presenting with acute onset of high-grade fever with:

- Rule out common aetiologies of acute febrile illness prevalent in the area (Dengue/DHF, typhoid, malaria etc.,)



A resident of Wayanad, displays tick bite marks on his body.

- Headache/Myalgia/Prostration/ Extreme weakness/Nausea/ Vomiting/Diarrhea/Occasionally neurological/Haemorrhagic manifestations

AND/ OR

- History of exposure to tick bite
- Travel and/or Living in and around forest area where laboratory confirmed KFD cases have been reported previously or an area where recent monkey deaths have been reported.


KFDV is transmitted by the bite of an infected tick, especially nymphal stage ticks.
WIKIMEDIA COMMONS

Laboratory Confirmed Case Definition

A presumptive case with:

- Detection of KFDV-specific viral RNA by reverse transcription polymerase chain reaction (RT-PCR) or real time RT-PCR from blood or tissues

OR

- Positive for immunoglobulin M (IgM) enzyme-linked immunosorbent assay (ELISA) for KFD

OR

- Isolation of KFDV in cell culture or in a mouse model, from blood or tissues.

Treatment

There is no specific treatment for KFD, but early hospitalization and supportive therapy is important. Supportive therapy includes the maintenance of hydration and the usual precautions for patients with bleeding disorders.

Prevention

- **Vaccination:** KFD vaccine is a formalin inactivated tissue culture vaccine. State Government of Karnataka is following KFD vaccination policy in the KFD endemic areas.
- **Personal Protection:** Application of repellants such as Dimethylphthalate (DMP), NN-Diethylm-Tolumaide (DEET) and certain other proprietary preparations on exposed body parts, if travelling to forest areas.
- IEC activities for generating awareness in the community regarding the disease, mode of transmission and prevention.
- Tick control measures.

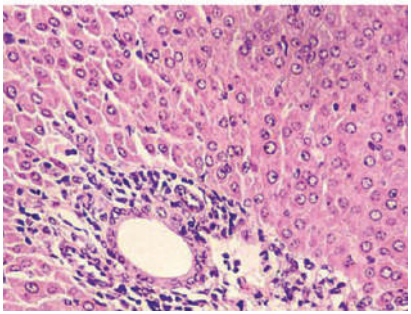
Public Health Measures to be Taken

- **Fever survey and maintain a line list of cases**
- **Symptomatic management of cases**
- **Entomological Assessment and Integrated Vector Control Measures.**

REFERENCES

1. Home :: Integrated Disease Surveillance Programme (IDSP)
2. https://ncdc.gov.in/WriteReadData/l892s/62082401691532083-718.pdf
3. https://www.cdc.gov/vhf/kyasanur/pdf/fact-sheet.pdf

Leptospirosis



Amastigotes in a chorionic villus.

Leptospirosis is an infectious disease caused by pathogenic organisms belonging to the genus Leptospira, that are transmitted directly or indirectly from animals to humans. Leptospirosis is a major direct zoonosis. Human to-human transmission occurs only very rarely.

Mode of Transmission

The bacteria that cause leptospirosis are spread through the urine of infected animals, which can get into water or soil and can survive there for weeks to months. Many different kinds of wild and domestic animals carry the bacterium, which include cattle, pigs, horses, dogs, rodents etc.

Humans can become infected through:

- Contact with urine (or other body fluids, except saliva) from infected animals.
- Contact with water, soil, or food contaminated with the urine of infected animals.

The bacteria can enter the body through skin or mucous membranes (eyes, nose, or mouth), especially if the skin is broken from a cut or scratch. Drinking contaminated water can also cause infection.

Who is at Risk of Infection?

- **Rice field planters, sugar cane and pineapple field harvesters, fishermen, sewer workers, masons, mine workers, veterinarians and animal caretakers**
- **It is also associated with swimming, wading, kayaking, and rafting in contaminated lakes and rivers.**

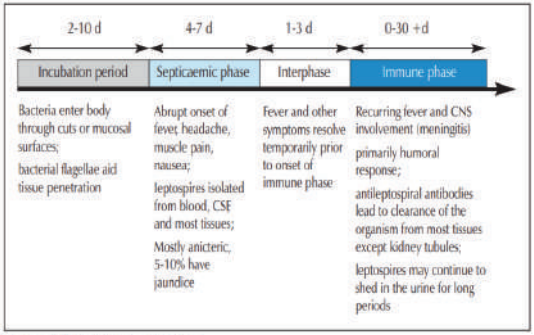
Signs and Symptoms

Leptospirosis has an incubation period of average 5-14 days with a range 2-30 days.

Typically, the disease presents in four broad clinical categories:

I. A mild, influenza-like illness
II. Weil's syndrome characterized by jaundice, renal failure, haemorrhage and myocarditis with arrhythmias
III. Meningitis/ meningoencephalitis
IV. Pulmonary haemorrhage with respiratory failure.

Figure 1: Typical course of leptospirosis



Courtesy: Dr Richard A. Collins, Hong Kong

Diagnosis

Presumptive Case Definition

A person having acute febrile illness with:

- Headache, myalgia and prostration associated with a history of exposure to infected animals or an environment contaminated with animal urine with **one or more** of the following
  - Calf muscle tenderness
  - Conjunctival suffusion
  - Anuria or oliguria and/or proteinuria
  - Jaundice
  - Hemorrhagic manifestations
  - Meningeal irritation
  - Nausea, vomiting, abdominal pain, diarrhoea

Laboratory Confirmed Case Definition

A case compatible with the clinical description of leptospirosis with at least one of the following:

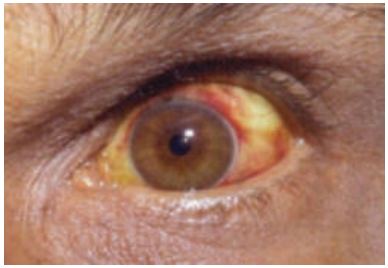
- High titre of IgM antibodies in ELISA (evaluated with locally determined cut off) for single clinical sample*.
- Four-fold or greater rise or persistent titre (in case of antibiotic given) in the MAT (total antibodies) between acute and convalescent-phase serum specimens run parallel.
- Seroconversion on ELISA in paired serology (demonstrating conversion of IgM to IgG antibodies).

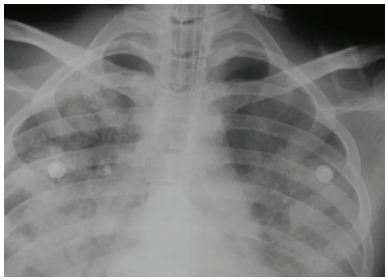
*A single serum sample showing high titres of IgM antibodies may indicate acute infection

These 1-3 tests are the preferred tests as ELISA are widely acceptable
Other: Isolation and Validated PCR can be done in patients who have not received antibiotic and in early stage of diseases (preferably less than seven days).

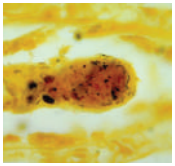
Treatment

- Adults: Doxycycline 100 mg twice a day for seven days
- Pregnant and lactating mothers should be given capsule ampicillin 500 mg every six hourly
- Children<8 years: Amoxycillin/Ampicillin 30-50 mg/kg/day in divided doses for 7 days.
- All suspected leptospirosis cases whether positive or negative with rapid immunodiagnostic test having feature of organ dysfunction as follows should be IMMEDIATELY shifted to higher centre.



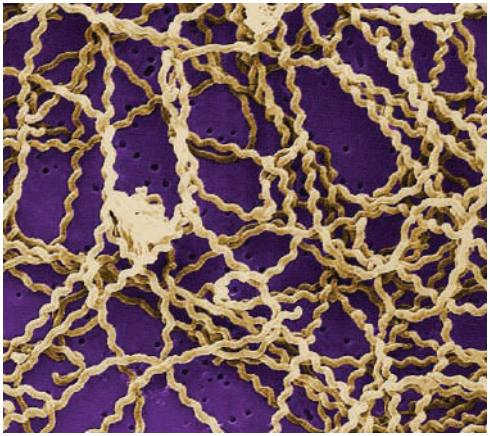


Conjunctival suffusion (red conjunctiva) together with jaundice is a specific feature of leptospirosis. (Top). Diffuse pulmonary haemorrhages of the lungs infected by leptospirosis (Above).



Photomicrograph of kidney tissue, using a silver staining technique, revealing the presence of Leptospira bacteria.

Scanning electron micrograph of a number of Leptospira sp. bacteria atop a 0.1 µm polycarbonate filter.



* Hypotension
* Decreased urine output
* Jaundice
* Haemoptysis or breathlessness
* Bleeding tendency
* Irregular pulse
* Altered level of consciousness

Public Health Measures to be Taken

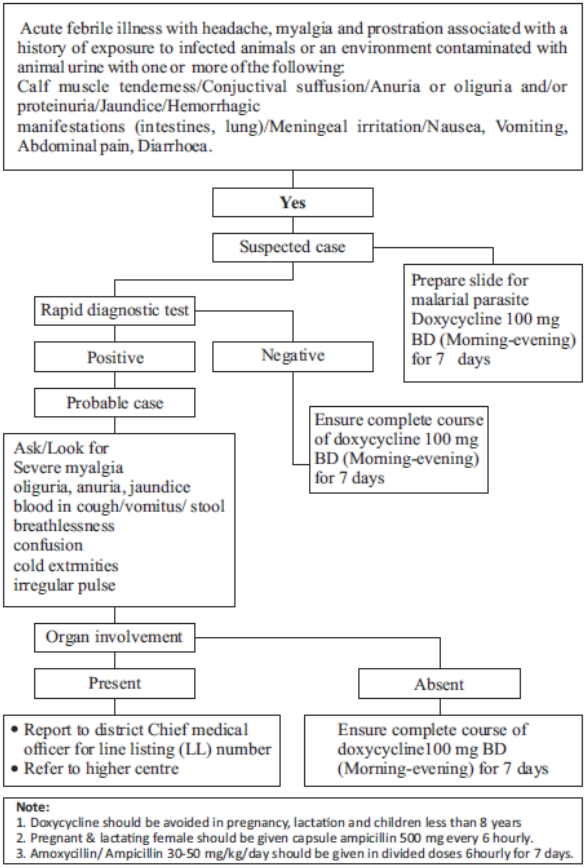
- **Fever survey and maintain a line list of cases**
- **Symptomatic management of cases**
- **Entomological assessment and Vector Control Measures.**

Prevention

Prevention of leptospirosis is based on the control of reservoir hosts by means of environmental and personal hygiene. Control measures against leptospirosis should comprise of:

- Protection of people against contagion by available means
  * Workers in flooded fields should be cautioned against direct contact with contaminated water or mud and should be advised to use rubber shoes and gloves. In case of any cuts or abrasion on the lower extremities of the body, the worker should apply an antiseptic ointment e.g. betadine, before entering the field and after exit.
- Health education
- Vaccination of animals
- Rodent control
- Mapping of water bodies for establishing a proper drainage system.
- **Chemoprophylaxis:** During the peak transmission season, Doxycycline 200 mg, once a week, may be given to agricultural workers (eg: paddy field workers, canal cleaning workers in endemic areas) from where clustering of cases has been reported. The chemoprophylaxis should not be extended for more than 6 weeks.

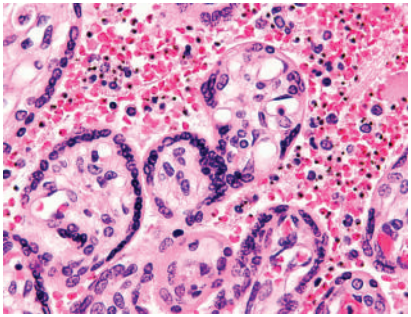
How to approach a case of leptospirosis at PHC level



REFERENCES

1. https://www.cdc.gov/leptospirosis/index.html
2. Human leptospirosis: guidance for diagnosis, surveillance and control, WHO, 2003
3. National Guidelines on Diagnosis, Case Management Prevention and Control of Leptospirosis, NCDC
4. Leptospirosis factsheet, WHO

Malaria



Very high magnification micrograph of maternal malaria. Placenta. H&E stain.

Malaria is a potentially life threatening parasitic disease caused by parasites known as Plasmodium viviax (P.vivax), Plasmodium falciparum (P.falciparum), Plasmodium malariae (P.malariae)and Plasmodium ovale (P.ovale).There are two types of parasites of human malaria, Plasmodium vivax, P. falciparum, which are commonly reported from India. Infection with P.falciparum is the most deadly form of malaria.

Mode of Transmission

It is transmitted by the infective bite of Anopheles mosquito. Man develops disease after ten to 14 days of being bitten by an infective mosquito. Inside the human host, the parasite undergoes a series of changes as part of its complex life cycle. The parasite completes life cycle in liver cells (pre-erythrocytic schizogony) and red blood cells (erythrocytic schizogony).

Who is at Risk of Infection?

- **High-transmission areas: young children and visitors from non-endemic areas**
- **Other areas: All age groups affected. Increased risk in pregnancy, PLHIV and who have undergone splenectomy.**

Signs and Symptoms

- Fever is the cardinal symptom of malaria. It can be intermittent with or without periodicity or continuous. Many cases have chills and rigors. The fever is often accompanied by headache, myalgia, arthralgia, anorexia, nausea and vomiting. The symptoms of malaria can be non-specific and mimic other diseases like viral infections, enteric fever etc.
- In a young child, there may be irritability, refusal to eat and vomiting.

Complications

Severe malaria is most commonly caused by infection with Plasmodium falciparum, although P. vivax can also cause severe disease. The risk is increased if treatment of an uncomplicated attack of malaria is delayed.

Clinical features of severe malaria include:

- Impaired consciousness (including unrousable coma).
- Prostration, i.e. generalized weakness so that the patient is unable to sit, stand or walk without assistance.
- Multiple convulsions: more than two episodes within 24 hours.
- Deep breathing and respiratory distress (acidotic breathing).
- Acute pulmonary oedema and acute respiratory distress syndrome.
- Circulatory collapse or shock, systolic blood pressure <80mm Hg in adults and <50mm Hg in children.

- Acute kidney injury.
- Clinical jaundice plus evidence of other vital organ dysfunction.
- Abnormal bleeding.

Anopheles stephensi mosquito.

Diagnosis

Presumptive Case Definition

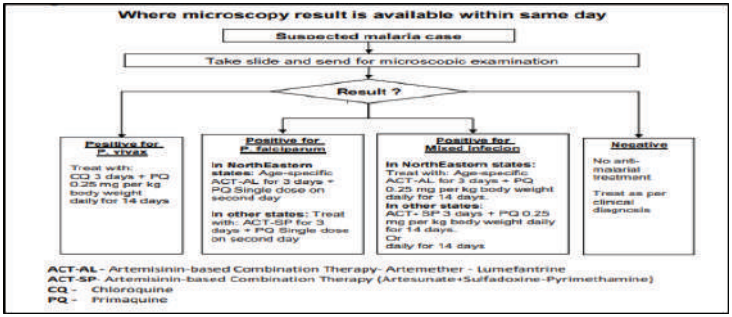
A suspected malaria case is a patient with fever in an endemic area during transmission season, or WHO has recently visited an endemic area, without any other obvious cause of fever like:

- Cough and bother signs of respiratory infection
- Running nose and other signs of cold
- Diarrhoea
- Pelvic inflammation indicated by severe low back ache, with or without vaginal discharge and urinary symptoms
- Skin rash suggestive of eruptive illness
- Burning micturition
- Skin infections e.g., boils, abscess, infected wounds
- Painful swelling of joints
- Ear discharge

Laboratory Confirmed Case Definition

A confirmed malaria case (or infection) is one in which the parasite has been detected by a diagnostic test, i.e. microscopy, rapid diagnostic test, or molecular diagnostic test.

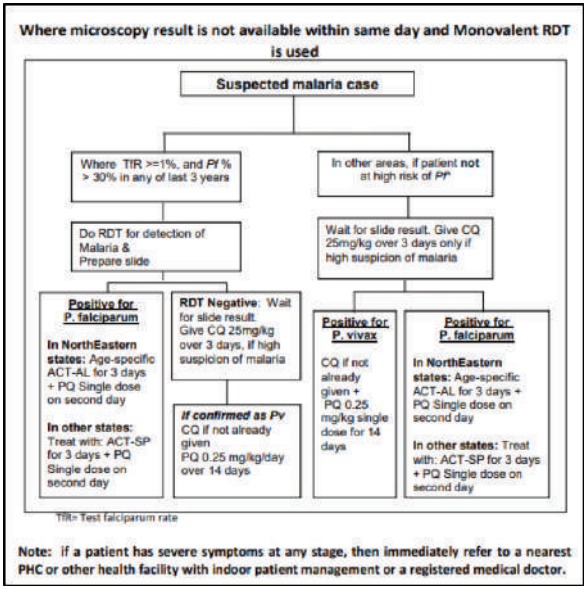
Treatment

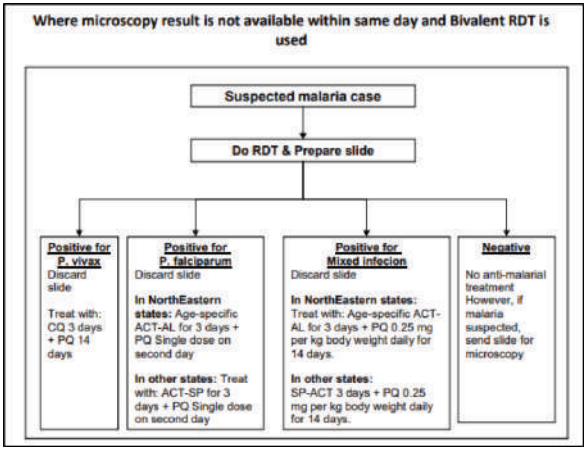


Sir Ronald Ross received the Nobel Prize for Physiology or Medicine in 1902 for his work on the transmission of malaria.

Public Health Measures to be Taken

- Fever survey and maintain a line list of cases.
- Symptomatic management of cases.
- Entomological Assessment and Integrated Vector Control Measures.





Mosquito nets protect children and adults from mosquitoes while they sleep. It is an inexpensive way to prevent malaria and protect families from sickness and even death.

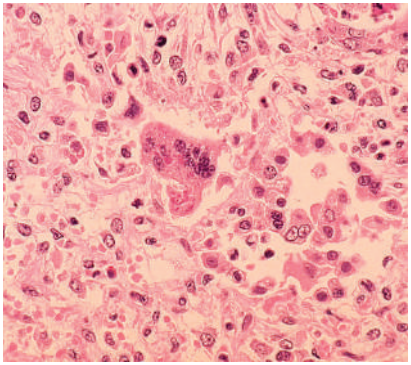
Prevention

- **Protection against mosquito bites:** Because of the nocturnal feeding habits of most of Anopheles mosquitoes, malaria transmission occurs primarily at night. Protection against mosquito bites include the use of mosquito bed nets (preferably insecticide-treated nets), the wearing of clothes that cover most of the body, and use of insect repellent on exposed skin.
- **Mosquito control:** Vector control measures depend on vector species, mosquito biology, epidemiological context, cost and acceptability by populations. The main current measures are focused on reduction of the contact between mosquitoes and humans, the destruction of larvae by environmental management and the use of larvicides or mosquito larvae predators, and destruction of adult mosquitoes by indoor residual spraying and insecticide-treated bed nets.
- **Chemoprophylaxis:** It should be administered only in selective groups in high P.falciparum endemic areas.
  - **Short term chemoprophylaxis (upto six weeks) Doxycycline:** 100 mg once daily for adult and 1.5 mg/kg once daily for children (contraindicated in children below eight years). The drug should be started two days before travel and continued for four weeks after leaving the malarious area. It is not recommended for pregnant women and children less than eight years.
  - **Chemoprophylaxis for longer stay (more than six weeks) Mefloquine:** 250 mg weekly for adults and should be administrated two weeks before, during and four weeks after exposure. Mefloquine is contraindicated in individuals with history of convulsions, neuropsychiatric problem and cardiac conditions.
- **Malaria Vaccines:** While several malaria vaccines are under development, none is available yet.

REFERENCES

1. https://www.who.int/news-room/fact-sheets/detail/malaria
2. https://nvbdcp.gov.in/
3. Management of severe malaria, WHO

Measles



Histopathology of measles pneumonia. Giant cell with intracytoplasmic inclusions.

Measles is caused by a virus in the paramyxovirus family and it is normally passed through direct contact and through the air. The virus infects the respiratory tract, then spreads throughout the body. Measles is a human disease and is not known to occur in animals.

Mode of Transmission

Measles is one of the world's most contagious diseases. It is spread by coughing and sneezing, close personal contact or direct contact with infected nasal or throat secretions.

The virus remains active and contagious in the air or on infected surfaces for up to two hours. It can be transmitted by an infected person from four days prior to the onset of the rash to four days after the rash erupts.

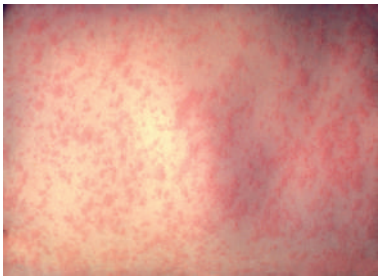
Who is at Risk of Infection?

- **Unvaccinated young children are at highest risk.**
- **Unvaccinated pregnant women.**
- **Any non-immune person (who has not been vaccinated or was vaccinated but did not develop immunity) can become infected.**

Signs and Symptoms

- **Fever:** One of the first sign of measles, which begins about 10-12 days after exposure to the virus, and lasts 4-7 days
- Runny nose and cough
- Red and watery eyes, and
- Small white spots inside the cheeks
- **Rash:** Occurs after several days, usually on the face and upper neck. Over about three days, the rash spreads, eventually reaching the hands and feet. The rash lasts for 5-6 days, and then fades. On average, the rash occurs 14 days after exposure to the virus (within a range of 7-18 days).

The skin of a patient after 3 days of measles infection.



Complications

- Most measles-related deaths are caused by complications associated with the disease
- Serious complications are more common in children under the age of five, or adults over the age of 30
- The most serious complications include
  - Blindness
  - Encephalitis
  - Severe diarrhoea and related dehydration
  - Ear infections, OR

* Severe respiratory infections such as pneumonia
- Severe measles is more likely among poorly nourished young children, especially those with insufficient vitamin A, OR whose immune systems have been weakened by HIV/AIDS or other diseases.

Diagnosis

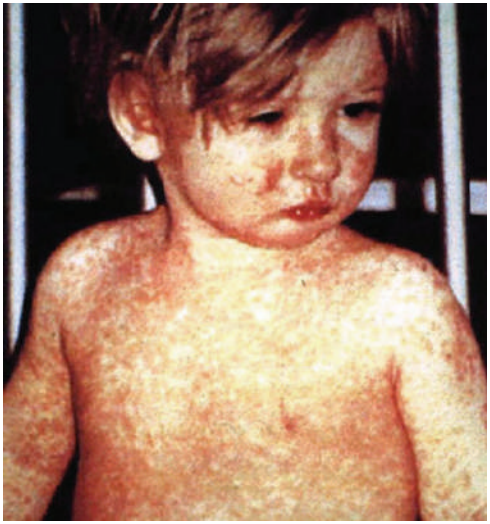
Presumptive Case Definition

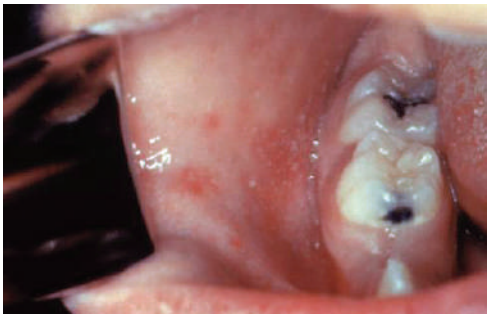
Any person with
- Acute fever and maculopapular (non-vesicular) rash, OR
- Any person in whom a clinician or health worker suspects measles or rubella infection.

Laboratory Confirmed Case Definition

A presumptive case with
- Detection of anti-measles IgM antibody by enzyme immunoassay (EIA), OR
- Measles virus detection through PCR from throat swab or urine or nasopharyngeal swab, OR
- Isolation of measles virus, OR
- Direct epidemiologic linkages to a case confirmed by one of the above methods

Note: Virology sample collection within seven days and serology sample collection within 28 days of onset of rash.





Top: This photo of a child shows a classic day-4 rash with measles.

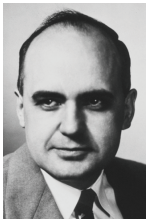
Above: This patient presented on the third pre-eruptive day with "Koplik spots" indicative of the beginning onset of measles.

Treatment

- No specific antiviral treatment exists for measles virus.
- Severe complications from measles can be reduced through supportive care.
- Antibiotics should be prescribed to treat eye and ear infections, and pneumonia.
- All children diagnosed with measles should receive two doses of vitamin A supplements, given 24 hours apart.

Prevention

Routine measles vaccination for children. Two doses of the vaccine are recommended to ensure immunity and prevent outbreaks.

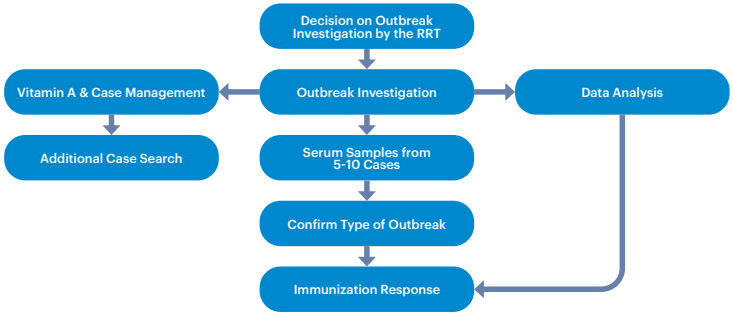


Maurice Ralph Hilleman was a leading American microbiologist who specialized in vaccinology. He and his team developed the vaccine for measles.

Public Health Measures to be Taken

- Enhanced case-based surveillance, active case search and contact tracing
- List of unimmunized/ unvaccinated children in the area.
- Isolation and symptomatic management of cases.
- Vaccination of susceptible.

Key Steps in Measles Outbreak Investigations



Laboratory Investigation for Confirmation

Type of Specimen	Type of Test	Volume to be collected	Timing of collection	Storage & Transport
Whole blood/ Serum	IgM ELISA	Collect 5 ml of blood by venipuncture	IgM ELISA tests for measles and rubella are more sensitive between days 4 and 28 after the onset of rash	Whole blood: 4-8°C (never freeze whole blood) for up to 24 hours or for 6 hours at 20-25°C before the serum is separated from clotted blood through centrifugation Serum should be stored at 4-8°C until shipment to laboratory, ideally no longer than 7 days
Nasopharyngeal/ Oropharyngeal	Viral isolation by cell culture Detection of Viral RNA by RT-PCR	Nasopharyngeal specimens can be taken by aspiration, lavage or swabbing the mucous membranes.	Nasopharyngeal specimens for virus isolation must be collected as soon as possible after the appearance of the rash	Nasopharyngeal specimens should be transported on wet ice (4-8°C), and should arrive at the testing laboratory within 48 hours
Urine	Viral isolation by cell culture Detection of Viral RNA by RT-PCR	A clean-catch 10-50 ml urine specimen should be collected in a sterile container	Isolation of measles virus from a urine specimen is most successful if collected within five days after rash onset	Stored at 4-8°C and should be shipped within 24 hours of collection DO NOT FREEZE whole urine specimens

Moradabad, Uttar Pradesh, India. Measles shot administered to 11-month-old Armaan as his mother Fatima clutches him.

- Measles first dose: nine completed months-12 months (Can be given up to five years if not received at 9-12 months of age.
- Measles second dose: 16-24 months.
- Dose of both doses: 0.5 ml subcutaneous at right upper arm.

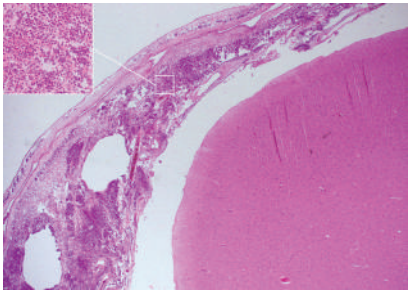
Outbreak Definitions

- **Suspected Outbreak:** Occurrence of five or more reported suspected measles cases in one month per 100,000 population living in a geographic area (e.g., district/block).
- **Confirmed Outbreak:** Occurrence of three or more confirmed measles cases (at least two of which should be laboratory confirmed: IgM positive) in a health facility/ district/block (approximate catchment population of 100,000) in a month.

REFERENCES

1. https://www.who.int/news-room/fact-sheets/detail/measles
2. https://www.cdc.gov/measles/hcp/index.html
3. https://mohfw.gov.in
4. https://www.nhp.gov.in/universal-immunisation-programme_pg

Meningitis



Histopathology of bacterial Meningitis: showing leptomeningeal inflammatory infiltrates consisting of neutrophilic granulocytes.

Meningococcal disease is an acute bacterial disease caused by meningococcus (Neisseria meningitidis), a gram-negative diplococcus. Meningococcal disease has two common outcomes – meningitis and meningococcemia. Meningitis is a devastating disease with a high case fatality rate and leading to serious long-term complications (sequelae).

Thirteen (13) serogroups of N. meningitidis have been identified based on capsular polysaccharide antigen i.e A, B, C, E, H, I, K, L, M, X, Y, Z, W135 and of these, A, B, C, W135, X and Y are known to cause most cases of meningitis.

Other important causes of acute bacterial meningitis are:

- Streptococcus pneumoniae (pneumococcus)
- Haemophilus influenzae
- Streptococcus agalactiae (group B streptococcus)
- Other bacteria such as Mycobacterium tuberculosis, Salmonella, Listeria, Streptococcus and Staphylococcus, viruses such as enteroviruses and mumps, fungi such as Cryptococcus, and parasites like Amoeba are also important causes of meningitis.

Who is at Risk of Infection?

- **Children and young adults are most at risk compared to other age groups**
- **Subjects with terminal complement component deficiency (C5-C9), properdin deficiency and asplenemia are more prone.**

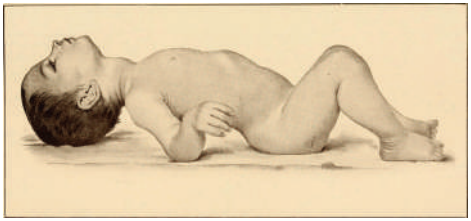
Mode of Transmission

Direct contact with droplets and discharge from nose and throat of patients and healthy carriers (mainly carriers).

Signs and Symptoms

- Sudden onset of intense headache.
- High fever.
- Stiff neck.
- Nausea and vomiting.
- Photophobia.
- Neurological signs like confusion, lethargy, delirium, coma, and/or convulsions.
- Infants may have illness without any stiff neck and onset could be slow vomiting.

Cerebro-spinal Meningitis (Meningoeoccus). Rigidity of the neck, opisthotonus, characteristic position , the arms. Infant eight months of age; fatal issue.



Complications

One in five people surviving an episode of bacterial meningitis may have long lasting after-effects such as; hearing loss, seizures, limb weakness, difficulties with vision, speech, language, memory, and communication, as well as scarring and limb amputations after sepsis.

Polysaccharide vaccines used in outbreak response, mainly in Africa.

Diagnosis

Presumptive Case Definition

Aperson having illness with sudden onset of fever (>38.5°C rectal or >38.0°C axillary), neck stiffness with one or more of the following:

- Headache, vomiting, Altered consciousness, Other meningeal signs, Petechial or purpural rash
- In patients <2 years, suspect meningitis when fever with bulging fontanelle present.

Laboratory Confirmed Case Definitions

A presumptive case with:

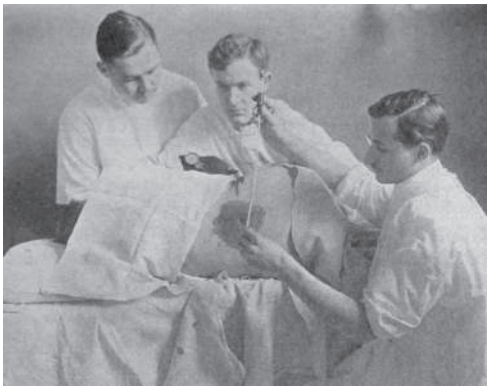
- Grams staining and/Or Antigen detection by Latex Agglutination Test in CSF

OR

- Isolation of N. meningitidis from blood or CSF

OR

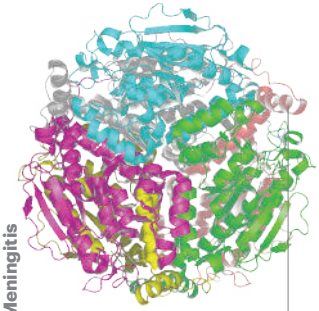
- Detection of N. meningitidis-specific nucleic acid in a specimen obtained from a normally sterile body site (e.g., blood or CSF), using a validated polymerase chain reaction (PCR) assay.



Operation of lumbar puncture and the technique in injecting the antimeningitis serum.

Treatment

- Admission to a hospital or health centre is necessary for diagnosis (lumbar puncture and CSF examination) and for treatment.
- Antimicrobial therapy is essential and should be combined with supportive treatment. Ciprofloxacin is the antibiotic of choice, and ceftriaxone is an alternative.
- As contagiousness of patients is moderate and disappears quickly following antimicrobial treatment, isolation of the patient is not necessary except probably during the first 24 hours of illness.



3D structure of MenB generated from Pymol.

Public Health Measures to be Taken

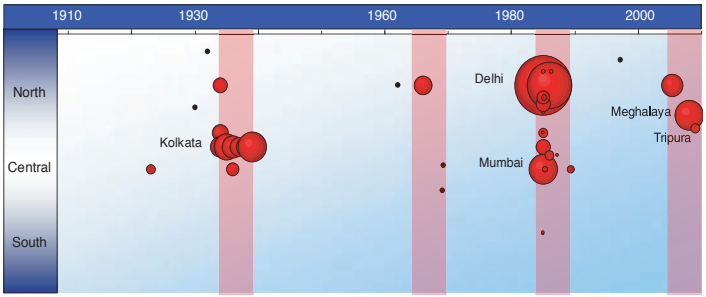
- Disease specific surveillance.
- Personal hygiene and respiratory etiquette.
- Quarantine/ isolation of cases.
- Vaccination as per GoI guidelines.

Meningococcal Vaccine is only recommended to be given to:

- Haj pilgrims and other travellers visiting the countries where meningococcal disease is a major problem or where outbreaks are occurring.
- High risk groups, eg children living in orphanages, jail inmates, soldiers in Barracks etc.
- Routine vaccination of the population at large is not recommended except during epidemic situations.

Laboratory Investigation for Confirmation

Type of Specimen	Test	Volume	Mode of Collection	Transportation
CSF and/or Blood	Gram stain culture and sensitivity	2 ml	Clean sterile container/Blood in blood culture media	At room temperature
CSF	Latex agglutination test	2 ml	Clean sterile container	At room temperature



Epidemiology of meningococcal disease in India (D. Sinclair et al.)

Prevention

Vaccination

There are 2 types of vaccines available:

- **Polysachharide vaccines:** Meningococcal polysaccharide vaccines are available in either bivalent (groups A and C), trivalent (groups A, C and W), or tetravalent (groups A, C, Y and W) forms to control the disease.
- **Conjugate vaccines:** The conjugate vaccines are more immunogenic and also induce immunogenic memory.
  - For group B, polysaccharide vaccines cannot be developed, due to antigenic mimicry with polysaccharide in human neurologic tissues. The first vaccine against NmB, made from a combination of 4 protein components, was released in 2014.
  - Since 1999, meningococcal conjugate vaccines against group C have been available and widely used. Tetravalent A, C, Y and W conjugate vaccines have been licensed since 2005 for use in children and adults in Canada, the United States of America, and Europe.

Mass Chemoprophylaxis

- Antibiotics for close contacts of those with meningococcal disease, when given promptly, decreases the risk of transmission.
- Outside the African meningitis belt, chemoprophylaxis is recommended for close contacts within the household. Within the meningitis belt, chemoprophylaxis for close contacts is recommended in non-epidemic situations.
- Ciprofloxacin is the antibiotic of choice, and ceftriaxone an alternative.

REFERENCES

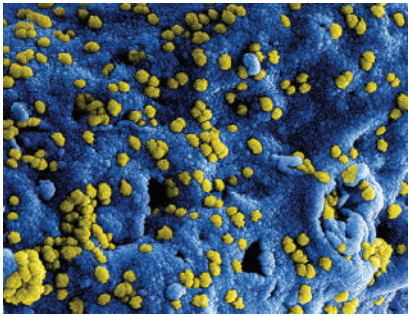
1. https://www.who.int/news-room/fact-sheets/detail/meningitis

2. https://www.who.int/emergencies/outbreak-toolkit/disease-outbreak-toolboxes/invasive-meningococcal-disease-outbreak-toolbox

3. https://ncdc.gov.in/WriteReadData/linkimages/OCT-NOV_098132922884.pdf

4. https://idsp.nic.in/index.php

MERS-CoV Middle East Respiratory Syndrome Coronavirus



Colorized scanning electron micrograph of MERS-CoV particles attached to the surface of an infected VERO E6 cell.

Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by Middle East respiratory syndrome coronavirus (MERS-CoV) that was first identified in Saudi Arabia in 2012. Coronaviruses are a large family of viruses that can cause diseases ranging from the common cold to Severe Acute Respiratory Syndrome (SARS).

Approximately 80% of human cases have been reported by Saudi Arabia, largely as a result of direct or indirect contact with infected dromedary camels or infected individuals in health care facilities. Cases identified outside the Middle East are usually individuals who appear to have been infected in the Middle East and then travelled to areas outside the region.

Who is at Risk of Infection?

- **People with diabetes, chronic lung disease, renal failure, and low immunity**
- **Consumption of raw or undercooked animal products**
- **Contact with dromedary camels and other animals.**

Mode of Transmission

- **Animal to human:** Camels are likely to be a major reservoir host for MERS-CoV and an animal source of infection in humans. The route of transmission of infection from camels to humans is not fully understood.
- **Human to human:** The virus does not appear to pass easily from person to person unless there is close contact, such as providing unprotected care to an infected patient.

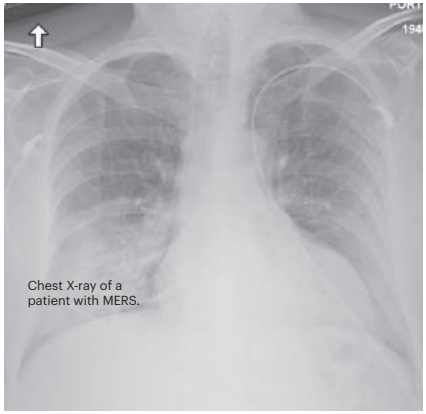
The median incubation period for secondary cases associated with limited human-to-human transmission is approximately five days (range two-14 days).

Signs and Symptoms

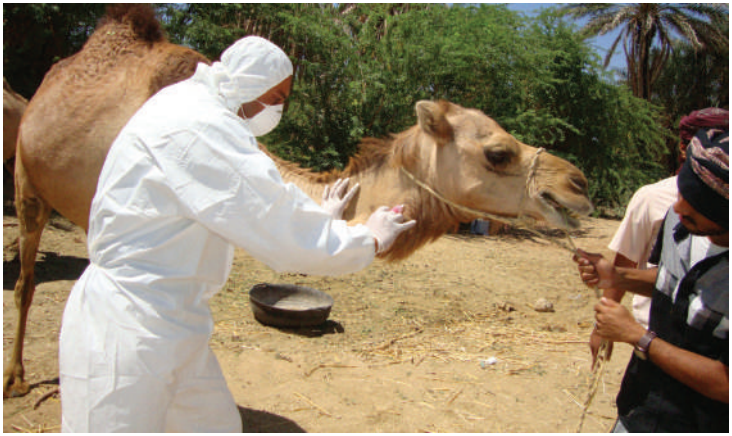
- Fever
- Cough
- Shortness of breath
- Pneumonia
- Gastrointestinal symptoms, including diarrhea.

Complications

Acute upper respiratory illness, rapidly progressive pneumonitis, respiratory failure, septic shock and multi-organ failure leading to death.



Chest X-ray of a patient with MERS.



A veterinarian takes samples from a dromedary during the first reported MERS-CoV case in Haramout, Yemen.

Diagnosis

Presumptive Case Definition

A person having contact/exposure with infected camel OR any of the following direct epidemiological link with a confirmed MERS-CoV patient:

- Travelling together with individuals infected with MERS-CoV in any kind of conveyance.
- Staying in the same close environment of a individuals infected with MERS-CoV.
- Working together in close proximity or sharing the same environment with individuals infected with MERS-CoV.
- Living in the same household as individuals infected with MERS-CoV.

AND

- An acute febrile illness and body ache, headache, diarrhoea, or nausea/ vomiting, with or without respiratory symptoms, and/or unexplained leucopenia (WBC<3.5X109/L) and thrombocytopenia (platelets<150X109/L)

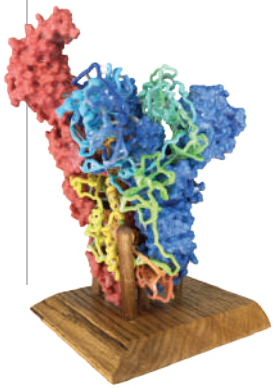
OR

- A person (including health care workers) who had protected or unprotected exposure to a confirmed or probable case of MERS-CoV infection and who presents with upper or lower respiratory illness within two weeks after exposure.

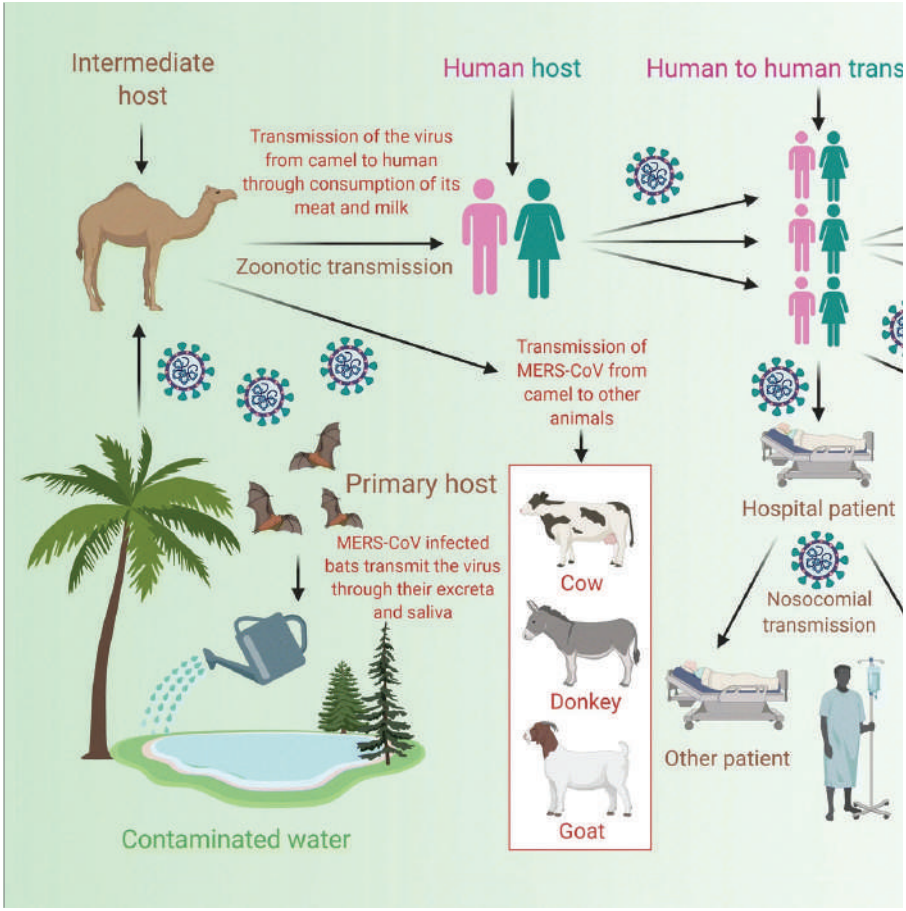
OR

- A person with fever and community-acquired pneumonia or acute respiratory distress syndrome based on clinical or radiological evidence. A hospitalized patient with healthcare associated pneumonia based on clinical and radiological evidence.

3D print of a coronavirus spike, a protein on the surface of the MERS-CoV that helps the virus enter and infect cells.

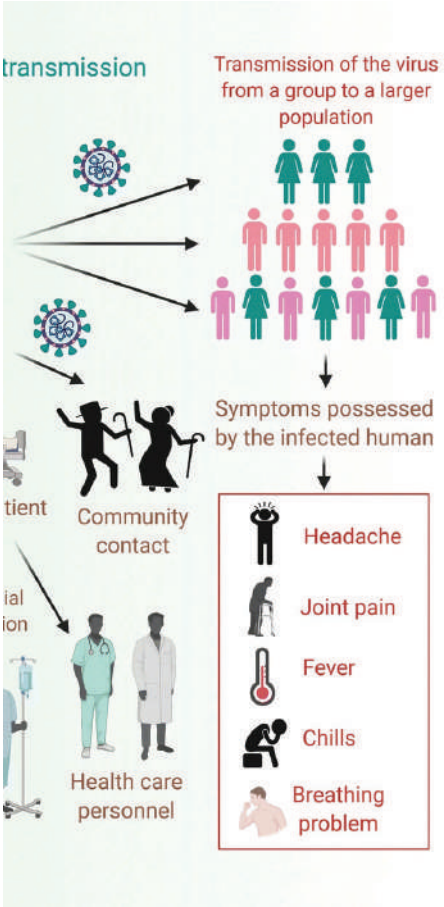


Schematic depiction of the transmission pattern of MERS-CoV and symptoms possessed by infected individual.



Public Health Measures to be Taken

- Early and complete identification of all contacts
- Quarantine or isolation and monitoring of all contacts and suspected cases
- Full implementation of infection, prevention and control measures
- Prevention of travel, especially internationally, of infected persons and contacts.



Laboratory Confirmed Case Definitions

A presumptive case with;

- The presence of viral nucleic acid can be confirmed by either positive results for nucleic acid amplification assays, such as;
  - Reverse transcription polymerase chain reaction (RT-PCR), for at least two specific genomic targets

OR

  - A single positive target with sequencing of a second target.

OR

- Demonstration of sero-conversion in 2 samples ideally taken at least 14 days apart, by a screening (ELISA, IFA) and a neutralization assay.

Treatment

- No specific treatment is currently available.
- Treatment is mostly supportive care and based on the patient's symptoms.

Prevention

- No vaccine is currently available.
- Avoid consumption of raw or uncooked meat or products such as camel meat/ milk.
- Practice general hygiene measures such as washing hands with soap, covering the nose and mouth with a tissue while coughing or sneezing, avoid touching eyes, nose and mouth with unwashed hands.
- Health care workers must use personal protective equipment such as gloves, gowns, respirators and goggles, while treating infected persons.

The origins of the MERS-CoV are not fully understood but according to the analysis of different virus genomes it is believed that it may have originated in bats and later transmitted to camels at some point in the distant past.

REFERENCES

1. Home :: Integrated Disease Surveillance Programme (IDSP)

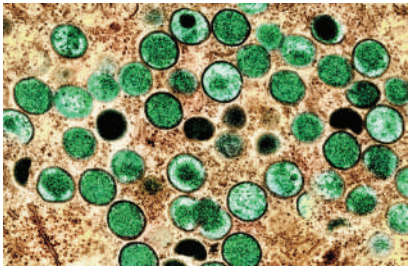
2. https://main.mohfw.gov.in/sites/default/files/22168398314349715 02_0.pdf

3. https://www.cdc.gov/coronavirus/mers/downloads/factsheet-mers_en.pdf

4. https://www.who.int/news-room/fact-sheets/detail/middle-east-respiratory-syndrome-coronavirus-(mers-cov)

5. file:///C:/Users/Jhpiego/Downloads/WHO_MERS_Clinical_15.1_eng.pdf

Monkeypox



Colorized transmission electron micrograph of monkeypox particles (teal) found within an infected cell (brown).

Monkeypox (MPox) disease is a viral zoonotic disease with symptoms similar to smallpox but with less clinical severity. Monkeypox virus (MPXV) is an enveloped double stranded DNA virus that belongs to the genus Orthopoxvirus and family Poxviridae. There are two distinct genetic clades of the monkeypox virus – the Central African (Congo Basin) clade and the West African clade. The Congo Basin clade has historically caused more severe disease and was thought to be more transmissible but recent literature from 2018-19 showed that the circulating strains predominantly belonged to the West African clade.

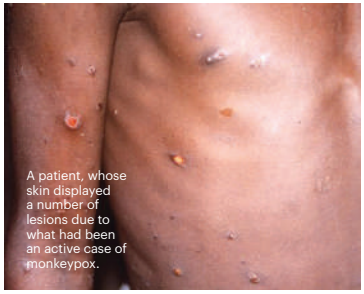
Mode of Transmission

- **Human-to-human transmission:** through large respiratory droplets after prolonged close contact or direct contact with body fluids or lesion material, and indirect contact with lesion material, such as through contaminated clothing or linens of an infected person.
- **Animal-to-human transmission:** may occur by bite or scratch of infected animals like small mammals including rodents (rats, squirrels) and non-human primates (monkeys, apes) or through bush meat (eg. Bats, monkeys, cane rats and duiker) preparation.

Signs and Symptoms

The incubation period of monkeypox is usually from 6-13 days but can range from 5-21 days. The infection can be divided into two phases:

- The invasion period (lasts between 0-5 days) characterized by fever, intense headache, lymphadenopathy, back pain, myalgia and intense asthenia. Lymphadenopathy is a distinctive feature of monkeypox compared to other diseases that may initially appear similar (chickenpox, measles, smallpox).
- The skin eruption usually begins within one - three days of appearance of fever. The rash tends to be more concentrated on the face and extremities rather than on the trunk. It affects the face (in 95% of cases), and palms of the hands and soles of the feet (in 75% of cases). Also affected are oral mucous membranes (in 70% of cases), genitalia (30%), and conjunctivae (20%), as well as the cornea. The rash evolves sequentially from macules to papules, vesicles, pustules, and crusts which dry up and fall off.



A patient, whose skin displayed a number of lesions due to what had been an active case of monkeypox.

Who is at Risk of Infection?

- **Close contacts of Monkeypox infected persons.**

Complications

Secondary infections, bronchopneumonia, sepsis, encephalitis, and infection of the cornea with ensuing loss of vision.

Diagnosis

Suspected Case (for screening)

A person of any age presenting with an unexplained acute rash* anywhere over the body, AND
One or more of the following signs or symptoms:

- Swollen lymph nodes • Fever • Headache • Body ache
- Profound weakness

(*Presence of acute onset ano-genital lesions may specifically be ascertained).

Probable Case (for sample collection, testing and isolation)

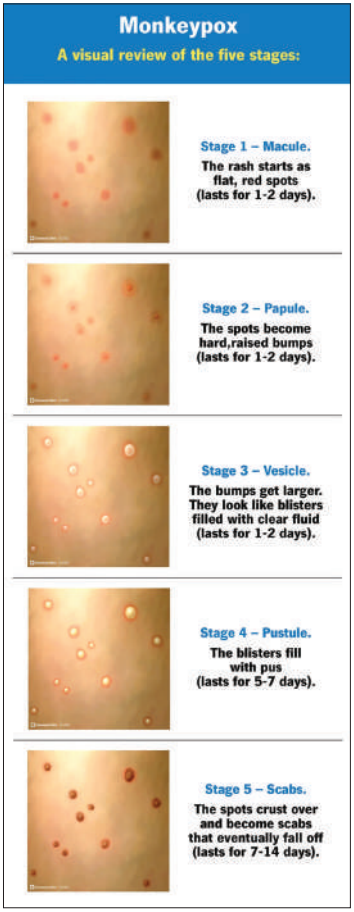
- A person meeting the suspected case definition and has an epidemiological link with a confirmed case (Direct physical contact with skin or skin lesions or body fluids or sexual contact; Face-to-face exposure, Health care workers without appropriate PPE; Contact with contaminated materials such as clothing, bedding or utensils), OR
- A clinically compatible case.

Confirmed Case (for management)

A case which is laboratory confirmed for monkeypox virus (by detection of unique sequences of viral DNA either by polymerase chain reaction (PCR) and/or sequencing).

Treatment

Symptoms of monkeypox often resolve on their own without any specific treatment. Clinical care for monkeypox mainly consists of measures to reduce symptoms, manage complications and prevent long-term sequelae. Currently there is no treatment approved specifically for monkeypox virus infections. However, antivirals developed for use in patients with smallpox may prove beneficial against monkeypox. Vaccinia immune globulin (VIG) may be recommended for severe cases. An antiviral agent that was developed to treat smallpox-tecovirimat was also approved for the treatment of monkeypox in January 2022.



Public Health Measures to be Taken

- **All suspected cases to be isolated until all lesions have resolved and a fresh layer of skin has formed OR until the treating physician decides to end isolation**
- **All such patients to be reported to the DSO, IDSP**
- **Laboratory samples to be sent to NIV, Pune**
- **In case a positive case is detected, contact tracing has to be initiated immediately to identify the contacts of the patient in the last 21 days.**

Principles of Management Include

- Patient isolation
- Protection of compromised skin and mucous membranes
- Rehydration therapy and nutritional support
- Symptom alleviation
- Monitoring and treatment of complications

Patient Isolation

- Isolation of the patient in an isolation room of the hospital/at home in a separate room with adequate ventilation.
- Patient to wear a triple layer mask.
- Skin lesions should be covered to the best extent possible (e.g. long sleeves, long pants) to minimize risk of contact with others.
- Isolation to be continued until all lesions have resolved and scabs have completely fallen off.

Prevention

General Preventive Measures:

- Avoid contact with any materials, such as bedding, that has been in contact with a sick person.
- Isolate infected patients from others.
- Practice good hand hygiene after contact with infected animals or humans. For example, washing your hands with soap and water or using an alcohol-based hand sanitizer.
- Use appropriate personal protective equipment (PPE) when caring for patients.

Reducing the Risk of Zoonotic Transmission

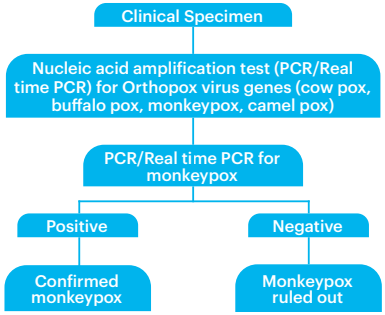
- Avoid unprotected contact with wild animals, especially those that are sick or dead (including their meat and blood).
- In endemic countries where animals carry monkeypox, any foods containing animal meat or parts should be cooked thoroughly before eating.
- Animal trade should be restricted. Any animal that might have come into contact with an infected animal should be quarantined, handled with standard precautions and observed for monkeypox symptoms for 30 days.

Woman and her skin affected by blistering rash because of monkeypox.

Reducing the Risk of Human to Human Transmission

- Limit contact with people who have suspected or confirmed monkeypox.
- Encourage the infected person to self-isolate and cover any skin lesion if they can (by wearing clothing over the rash).
- Wear a medical mask, regularly wash your hands with soap and water or an alcohol-based hand rub, use gloves and other personal protective clothing and equipment while taking care of the sick, whether in a health facility or at home.
- Wash the infected person's clothes, towels and bedsheets and eating utensils with warm water and detergent. Clean and disinfect any contaminated surfaces and dispose of contaminated waste (e.g., dressings) appropriately.

Laboratory Investigation for Confirmation



Specimen Collection for Symptomatic Cases

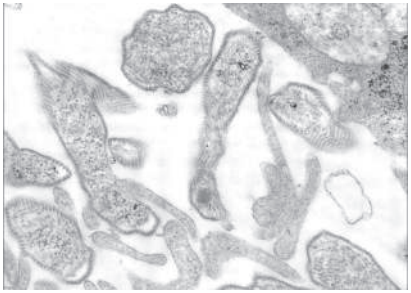
Rash Phase	Recovery Phase
Lesion roof- with scalpel or plastic scrapper collected in plain tube* • Lesion fluid with intradermal syringe* • Lesion base scrapings with sterile polyester swab collected in plain tube* • Lesion crust in plain tube* • NPS/OPS in dry plain tube [without any bacterial medium or VTM] • Blood collected in SSGT (4-5 ml) • Blood collected in EDTA (2-3 ml) • Urine in sterile urine container (3-5 ml)	• Blood collected in SSGT (4-5 ml) • Urine in sterile urine container (3-5 ml)

* The specimens from lesion should be collected from multiple sites

REFERENCES

1. Home :: Integrated Disease Surveillance Programme (IDSP)
2. https://ncdc.gov.in/WriteReadData/l892s/1319769477165942 4426.pdf
3. https://www.who.int/news-room/fact-sheets/detail/monkeypox
4. https://www.cdc.gov/poxvirus/monkeypox/index.html
5. https://main.mohfw.gov.in/sites/default/files/Guidelines%20for%20Management%20of%20Monkeypox%20Disease.pdf

Mumps



Colorized scanning electron micrograph of MERS-CoV particles attached to the surface of an infected VERO E6 cell.

Mumps is an acute disease of children and young adults, caused by a paramyxovirus of which there is only a single serotype. Humans are the only known host for mumps virus.

Mode of Transmission

Mumps is spread via direct contact or by airborne droplets from the upper respiratory tract of infected individuals.

Signs and Symptoms

- After an incubation period of 2-4 weeks, mumps begins with non-specific symptoms such as myalgia, headache, malaise and low-grade fever
- Within days, these symptoms are followed by unilateral or bilateral swelling of the parotid salivary glands, with other salivary glands affected in 10% of cases.
- Symptoms typically occur 16-18 days after exposure to the virus and resolve within two weeks. About one third of infections are asymptomatic.

Complications

Normally mumps is a mild, self-limiting disease and disappears without sequelae. However, complications may occur such as encephalitis or sensorineural deafness. Orchitis occurs in 20% of young adult males who develop mumps.

Diagnosis

Presumptive Case Definition

Acute onset of

- Unilateral or bilateral parotitis or other salivary gland swelling lasting at least 2 days, OR
- Orchitis or oophoritis unexplained by other apparent cause.

Laboratory Confirmed Case Definition

A presumptive case with

- Isolation of mumps virus by culture or reverse transcription-polymerase chain reaction (RT-PCR) from an appropriate clinical specimen (buccal/oral swab, throat swab, urine, and cerebrospinal fluid), OR
- Seroconversion from IgG negative to IgG positive as determined by any standard serological assay in the absence of mumps immunization in the preceding six weeks, OR
- In unvaccinated individuals, significant (≥ fourfold) rise in serum mumps IgG titre as determined by any standard serological assay.

Who is at Risk of Infection?

- **Mumps is frequently reported in children aged five-nine years of age, although both adolescents and adults may be affected.**

Treatment

No specific therapy for mumps exists. Symptomatic treatment can be given. Mumps is a self-limited illness that can last a few weeks. It is recommended that mumps cases be isolated from other patients for five days post-parotitis onset. Standard contact and droplet precautions should be put in place.

Prevention

Contacts of the case during the two days prior through nine days after onset of parotitis should be identified as potentially infected. All contacts should be educated about signs and symptoms of mumps.

Outbreak Definitions

A mumps outbreak is defined as three or more cases linked by time and place.

Laboratory Investigation for Confirmation

Type of Specimen	Test	Timing of Collection	Storage and Transport
• **Buccal/Oral swab** • **Throat swab**	Viral Culture RT-PCR	• RT-PCR detection of virus is highest on day one after onset of parotitis (> 80%) dropping by day three (< 50%)	• Swab is placed in at least 2 ml of standard viral transport medium (VTM). Allow the swab to remain in VTM for at least one hour at 4°C. • It maintained at 4°C and shipped on cold packs (4°C) within 24 hours. • If there is a delay in shipment, the sample is best preserved by freezing at –70°C and should be shipped on dry ice.
• **Whole blood/Serum**	ELISA	• Acute phase: as soon as possible of symptom onset • Convalescent phase: 10-14 days later • Sera for IgM testing should be collected > 3 days post-parotitis onset	• Whole blood can be stored for six hours at 20-25°C or at 4-8°C for up to 24 hours. Never freeze whole blood • Serum should be stored at 4-8°C until shipment on wet ice packs, but ideally should not be held at 4-8°C for longer than seven days. When held for longer periods, serum samples must be frozen at –20°C or below and transported to the testing laboratory on frozen ice packs

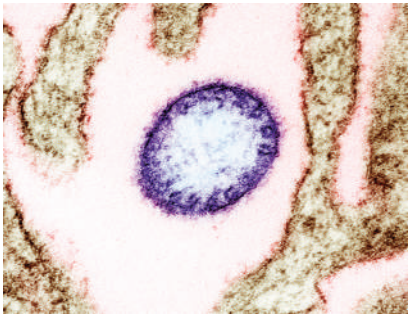
Public Health Measures to be Taken

- **Enhanced case-based surveillance and active case search**
- **Contact Tracing**
- **List of unimmunized /unvaccinated children in the area**
- **Isolation and symptomatic management of cases**
- **Vaccination of susceptible as per GoI guidelines.**

REFERENCES

1. Home :: Integrated Disease Surveillance Programme (IDSP)
2. Vaccine-Preventable Diseases Surveillance Standards, WHO, 2018
3. https://www.nhp.gov.in/disease/communicable-disease/mumps
4. https://www.cdc.gov/mumps/index.html
5. https://www.who.int/teams/health-product-policy-and-standards/standards-and-specifications/vaccine-standardization/mumps

Nipah Virus



Colorized transmission electron micrograph of a mature extracellular Nipah Virus particle (purple) near the periphery of an infected VERO cell (brown).

Nipah virus (NiV) is a member of the family Paramyxoviridae, genus Henipavirus. It is a zoonotic virus, meaning that it initially spreads between animals and people. The animal host reservoir for NiV is the fruit bat (genus Pteropus), also known as the flying fox. Infected fruit bats can spread the disease to people or other animals, such as pigs, that may presumably become infected after consumption of partially bat eaten fruits that are dropped in pigsties. People can become infected if they have close contact with an infected animal or its body fluids (such as saliva or urine)—this initial spread from an animal to a person is known as a spillover event. Once it spreads to people, person-to-person spread of NiV can also occur.

Who is at Risk of Infection?

- **Animal handlers, especially those working in pig farms.**
- **Consumption of infected fruits or raw date palm sap.**
- **Close contact with a person with Nipah virus disease.**

Mode of Transmission

Nipah virus (NiV) can spread to people from:

- Direct contact with infected animals, such as bats or pigs, or their body fluids (such as blood, urine or saliva).
- Consuming food products that have been contaminated by body fluids of infected animals (such as palm sap or fruit contaminated by an infected bat).
- Close contact with a person infected with NiV or their body fluids (including nasal or respiratory droplets, urine, or blood).

Signs and Symptoms

Fever, altered mental status, severe weakness, headache, respiratory distress, cough, vomiting, muscle pain, convulsion and diarrhea.

Complications

In infected people, Nipah virus causes severe illness characterized by inflammation of the brain (encephalitis) or respiratory diseases. In general, the case–fatality rate is estimated at 40-75%; however, this rate can vary by outbreak and can be up to 100%.

Pigs at a pig farm.

Treatment

Currently there is no known treatment or vaccine available for either people or animals. However Ribavirin may have a role in reducing mortality among patients with encephalitis caused by Nipah virus disease. Intensive supportive care with treatment of symptoms is the main approach to managing the infection in people.

Bats cause the transmission of the Nipah virus. Researchers collect samples from the fruit bats to trace the virus.

Prevention

- Practice handwashing regularly with soap and water
- Avoid contact with sick bats or pigs
- Avoid areas where bats are known to roost
- Avoid eating or drinking products that could be contaminated by bats, such as raw date palm sap, raw fruit, or fruit that is found on the ground
- Avoid contact with the blood or body fluids of any person known to be infected with NiV.

Outbreak Definitions

Suspect Nipah Case

Person from a community affected by a Nipah virus (NiV) disease outbreak who has:

- Fever with new onset of altered mental status or seizure

and/or

- Fever with headache

and/or

- Fever with cough or shortness of breath

and/or

- Direct contact with a confirmed case

Probable Nipah Case

- Suspect case-patient/s who resided in the same village/ward, where suspect/ confirmed case of Nipah were living during the outbreak period and who died before complete diagnostic specimens could be collected. OR
- Suspect case-patients who came in direct contact with confirmed case-patients in a hospital setting during the outbreak period and who died before complete diagnostic specimens could be collected.

Health workers collect blood samples from a goat to test for the Nipah virus in Kozhikode, Kerala.

Doctors wearing protective gear examine a patient at a hospital in Kozhikode, in the southern state of Kerala.

Public Health Measures to be Taken

- **In suspected outbreaks, the animal premises should be quarantined immediately with restriction of animal movements from infected farms to other areas**
- **Establishing a surveillance system, using a One Health approach, to detect Nipah cases**
- **Raising awareness and educating people about the measures they can take to reduce exposure to the virus.**

Confirmed Nipah Case

A presumptive case with

- Nipah virus RNA identified by PCR from respiratory secretions, urine, or cerebrospinal fluid

OR

- Isolation of Nipah virus from respiratory secretions, urine or cerebrospinal fluid.

Close Contact of a Nipah Case

A close contact is defined as a patient or a person who came in contact with a Nipah case (confirmed or probable cases) in at least one of the following ways;

- Was admitted simultaneously in a hospital ward/shared room with a suspect/confirmed case of Nipah
- Has had direct close physical contact with the suspect/confirmed case of Nipah during the illness including during transportation.
- Has had direct close contact with the (deceased) suspect/confirmed case of Nipah at a funeral or during burial preparation rituals
- Has touched the blood or body fluids (saliva, urine, vomitus etc.) of a suspect/confirmed case of Nipah during their illness
- Has touched the clothes or linens of a suspect/confirmed case of Nipah

Officials inspect a well to to catch bats at Changaroth in Kozhikode in the Indian state of Kerala on May 21, 2018, during an outbreak of the deadly Nipah virus carried mainly by fruit bats.

These contacts need to be followed up for appearance of symptoms of NiV for the longest incubation period (21 days).

Laboratory Investigation for Confirmation

Presently National Institute of Virology, Pune is the testing laboratory which is diagnosing Nipah virus infection based on molecular detection of viral RNA and IgM antibody detection by ELISA test.

The Nipah virus is classified as a biosafety level four (BSL-4) pathogen and requires special containment and barrier protection measures for laboratory personnel, as well as for any people taking care of potentially infected patients or dead bodies.

REFERENCES

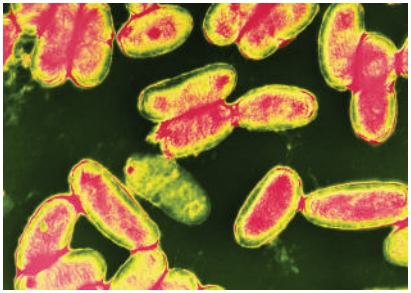
1. https://ncdc.gov.in/index4.php?lang=1&level=0&linkid=113&lid=228

2. https://www.who.int/news-room/fact-sheets/detail/nipah-virus

3. https://www.cdc.gov/vhf/nipah/index.html#:~:text=Nipah%20virus%20is%20also%20known,Asia%2C%20primarily%20Bangladesh%20and%20India

4. Home: Integrated Disease Surveillance Programme (IDSP)

Pertussis



False-color transmission electron micrograph of a field of whooping cough bacteria, *Bordetella pertussis*.

Pertussis is a highly contagious acute infectious disease of the respiratory tract caused by the bacterium Bordetella pertussis. It is commonly known as whooping cough. The name pertussis means “violent cough”, which aptly describes the most consistent and prominent feature of the illness.

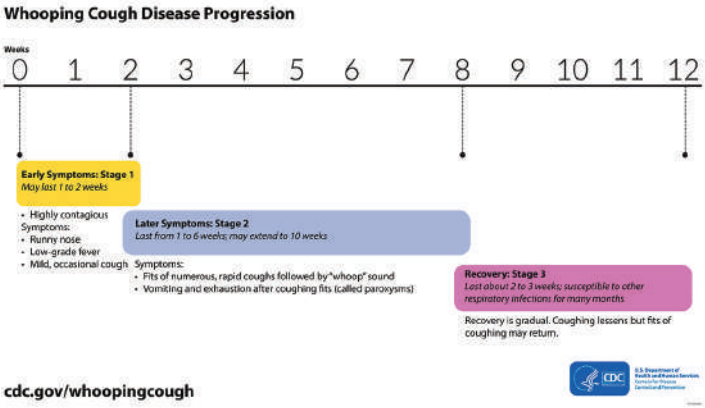
Mode of Transmission

B. pertussis is a human-specific pathogen and is unable to survive outside its human host. It spreads easily from person to person mainly through droplets produced by coughing or sneezing. The incubation period is commonly 9-10 days, with a range of 6-20 days.

People with pertussis are most contagious up to about three weeks after the cough begins. The secondary attack rate for susceptible household contacts is 80-100%.

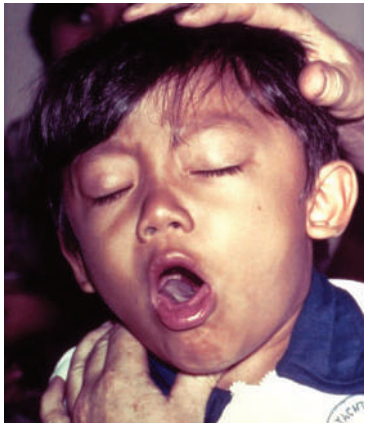
Signs and Symptoms

The illness begins less dramatically with non-specific symptoms and then progresses in the following three stages:



Who is at Risk of Infection?

- **The disease is most dangerous in infants, and is a significant cause of disease and death in this age group.**



Pertussis rates are highest among young children in countries that have lower vaccination coverage.

Other common features of pertussis are:

Infants

Apnoea, Cough (no whoop), Cyanotic episodes, Vomiting, Poor feeding, Fever, Seizures, Sudden Infant Death Syndrome.

Partially immunized

Duration of catarrhal phase may be reduced and whoop may not occur.

Adults

Prolonged cough, Paroxysmal cough, Whoop, Post-tussive vomiting, Intracranial haemorrhage.

Complications

- Most common is secondary bacterial pneumonia.
- Neurological complications such as seizures and encephalopathy occur rarely.
- Less serious complication includes otitis media, anorexia and dehydration.
- Complications from pressure effects of severe paroxysms include pneumothorax, epistaxis, subdural hematomas, hernias and rectal prolapse.

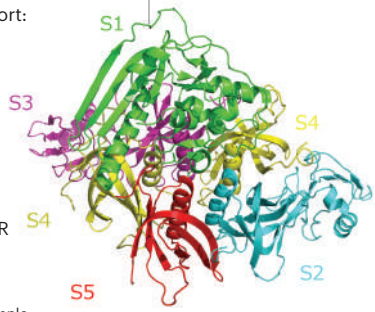
Diagnosis

Presumptive Case Definition

Person of any age with

- Cough lasting ≥ 2 weeks, or of any duration in an infant or any person in an outbreak setting, without a more likely diagnosis, AND
- At least one of the following symptoms on observation or parental report:
  - Paroxysms (i.e. fits) of coughing
  - Inspiratory whooping
  - Post-tussive vomiting, or vomiting without other apparent cause
  - Apnoea in infants, OR
- Clinician suspicion of Pertussis.

3D representation of the molecular structure of pertussis toxin.



Laboratory Confirmed Case Definition

A presumptive case with

- Isolation of Bordetella pertussis from a clinical specimen by culture, OR
- Detection by PCR from a clinical specimen, OR
- Single serum positive for IgG antibody

Note: Nasopharyngeal swab collection within 4 weeks of onset of cough and serology sample collection within 12 weeks of onset of cough.

Treatment

Treatment is most effective in reducing symptoms if commenced within the first two weeks before the coughing paroxysms occur. Most previously immunized adults or adolescents recover even without antibiotics because of milder illness as compared to infants and young children

Age Group	Azithromycin	Erythromycin*	Clarithromycin	Alternate agent: TMP-SMX +
< 1 month	Recommended agent for infants < 1 month of age; 10 mg/kg per day in a single dose x 5 days #	40-50 mg/kg per day in 4 divided doses x 14 days	Not recommended	Contraindicated in infants < 2 months of age (risk for kernicterus)
1-5 months	10 mg/kg per day in a single dose x 5 days	40-50 mg/kg per day in 4 divided doses x 14 days	15 mg/kg per day in 2 divided doses x 7 days	Contraindicated in infants < 2 months of age. For infants > 2 months of age, TMP 8 mg/kg per day; SMX 40 mg/kg per day in 2 divided doses x 14 da
Infants aged ≥ 6 months and children	10 mg/kg per day in a single dose on Day 1 (maximum 500 mg); then 5 mg/kg per day as a single dose on Days 2-5 (maximum 250 mg/day)	40-50 mg/kg per day in 4 divided doses x 14 days	15 mg/kg per day in 2 divided doses x 7 days	TMP 8 mg/kg per day; SMX 40 mg/kg per day in 2 divided doses x 14 days
Adolescents and adults	500 mg as a single dose on Day 1 then 250 mg as a ingle dose on Days 2-5	2 g/day in in 4 divided doses x 14 days	1 g/day in in 2 divided doses x 7 days	TMP 320 mg/day, SMX 1600 mg/day in 2 divided doses x 14 days

Prevention

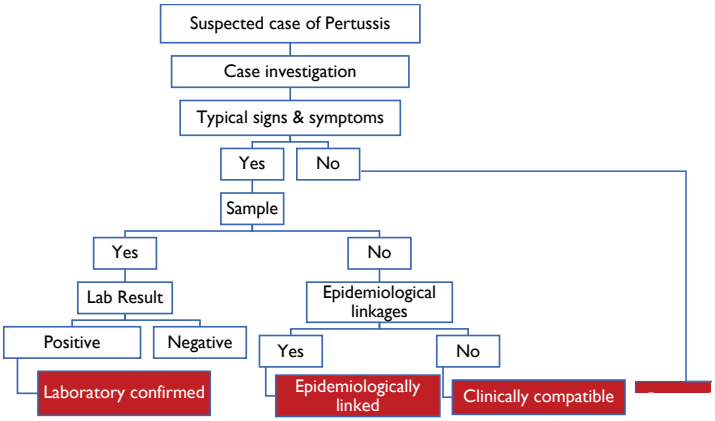
The only effective way to prevent Pertussis in children is to provide active immunization to all children

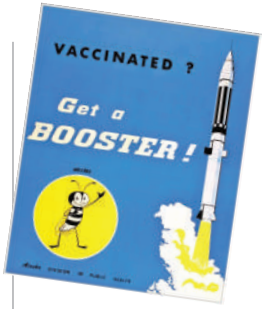
Pentavalent vaccine (DPT+ Hep B+ Hib vaccine) is recommended as three doses in UIP given at 6, 10 and 14 weeks. Two booster doses of DPT are given: 1st booster at 16-24 months and second booster at 5-6 years of age. The dosage of the vaccine is 0.5 ml given intramuscular at the anterolateral aspect of left thigh.

Public Health Measures to be Taken

- Enhanced case-based surveillance and active case search
- Contact Tracing
- List of unimmunized/ unvaccinated children in the area
- Isolation and symptomatic management of cases
- Vaccination of susceptible as per GoI guidelines.

Algorithm of case classification of a suspected case of Pertussis





This 1964 poster featured what at that time, was CDC's national symbol of public health, the "Wellbee", who here was reminding the public to get a booster vaccination.

Outbreak Definitions

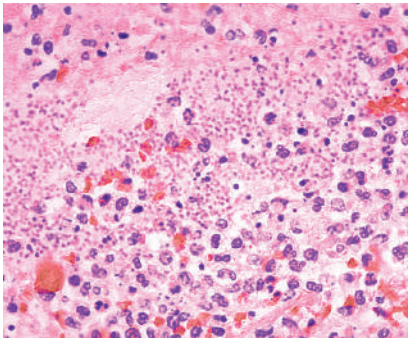
Pertussis outbreak is declared when there is increase in cases in a geographical area more than expected.

Type of Specimen	Timing of Collection	Storage & Transport	Test Performed
Nasopharyngeal swab	Within 4 weeks from onset of cough	• Use Regan-Lowe/Amies transport media with charcoal • Storage and transportation at 2-8°C	• Culture • PCR
Serum	Within 12 weeks	• No transport media required • Storage and transportation at 2-8°C	• PCR • Serological testing

REFERENCES

1. Pertussis (who.int)
2. Whooping Cough (Pertussis) | CDC
3. Whooping Cough/ Pertussis | National Health Portal Of India (nhp.gov.in)
4. https://www.nhp.gov.in/universal-immunisation-programme_pg
5. Surveillance for Diphtheria, Pertussis and Neonatal Tetanus, MoHFW, GoI, 2020

Plague



Histological section of tissue from a lung of an individual affected by pneumonic plague.

Plague is an infectious disease affecting both animals and humans and caused by the bacterium, Yersinia pestis. *Yersinia pestis*, maintains its existence in a cycle involving rodents and their fleas. Under the International Health Regulations, WHO Member States have to notify plague when it occurs in humans in their territories.

Mode of Transmission

Humans can be infected through:

- The bite of infected vector fleas.
- Unprotected contact with infectious bodily fluids or contaminated materials.
- The inhalation of respiratory droplets/small particles from a patient with pneumonic plague.

Signs and Symptoms

People infected with plague usually develop acute febrile disease with other non-specific systemic symptoms such as sudden onset of fever, chills, head and body aches, and weakness, vomiting and nausea, after an incubation period of 1-7 days.

There are following forms of plague infection, depending on the route of infection, may occur in isolation or in combination;

- **Bubonic** plague is the most common form of plague and is caused by the bite of an infected flea. Plague bacillus, Y. pestis, enters at the bite and travels through the lymphatic system to the nearest lymph node where it replicates itself. The lymph node then becomes inflamed, tense and painful, and is called a 'bubo'. At advanced stages of the infection the inflamed lymph nodes can turn into open sores filled with pus. Human to human transmission of bubonic plague is rare. Bubonic plague can advance and spread to the lungs, which is the more severe type of plague called pneumonic plague.
- **Pneumonic** plague, or lung-based plague, is the most virulent form of plague. Incubation can be as short as 24 hours. Any person with pneumonic plague may transmit the disease via droplets to other humans. Untreated pneumonic plague, if not diagnosed and treated early, can be fatal. However, recovery rates are high if detected and treated in time (within 24 hours of onset of symptoms).

Right hand of a plague patient displaying acral gangrene. Gangrene is one of the manifestations of plague.

Who is at Risk of Infection?

- ~~The disease is most dangerous in infants, and is a significant cause of disease and death in this age group.~~

- **Septicemic** plague occurs when plague bacteria multiply in the blood. It can be a complication of pneumonic or bubonic plague or it can occur by itself. When it occurs alone, it is caused in the same ways as bubonic plague; however, buboes do not develop. Patients have fever, chills, prostration, abdominal pain, shock, and bleeding into skin and other organs. Septicemic plague does not spread from person to person.

Diagnosis

Presumptive Case Definition

A suspect case with compatible clinical Presentation* and consistent epidemiological features such as exposure to infected animals or humans and/or evidence of flea bites and/or residence in or travel to a known endemic focus within the previous ten days.

And/OR Any of the following tests are positive;

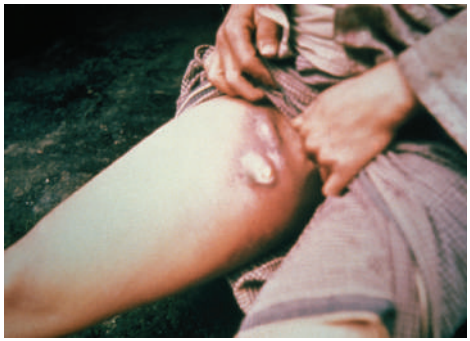
- **Microscopy:** Material from bubo, blood, sputum contains gram negative coccobacilli in Grams staining and bipolar after Wayson or Giemsa staining.
- F1 antigen detection in bubo aspirate, blood or sputum.
- A single anti F1 serology without evidence of previous Y. pestis infection or vaccination.

Laboratory Confirmed Case Definition

A presumptive case with an isolate from a clinical sample identified as Y.pestis, and two of the four following tests must be positive:

- Y.pestis biochemical profile.
- Bacteriophage lysis of culture.
- F1 Antigen detection
- PCR (pla gene, F1 gene), OR
- A fourfold difference in anti F1 antibody titre in paired serum samples, OR
- Direct validated PCR on clinical specimen.

A group of officials making a visit to a house in Bombay, to inspect people with plague, 1896.



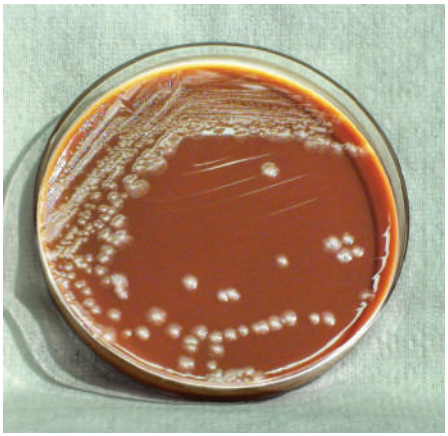
A patient displaying a swollen, ruptured inguinal lymph node, or buboe.

Treatment

Treatment as per WHO guidelines for plague management:

Indication	Form of Plague	First-line Choice
Treatment	Pneumonic or Septicaemic	Streptomycin, or Gentamicin
	Bubonic	Streptomycin, Doxycycline, or Gentamicin
	Meningitis	Chloramphenicol
	Any in Pregnancy	Gentamicin
Postexposure presumptive treatment	NA	Doxycycline, or Sulfamethoxazole+ trimethoprim
Pre-exposure Chemoprophylaxis	NA	Tetracycline, doxycycline, sulfamethoxazole + trimethoprim, or ciprofloxacin

- The antibiotic therapy should be given for at least for 10 days. Resistant strains have been isolated; treatment should be guided by antibiotic sensitivities where available. Antibiotics that should not be used for the treatment of plague include penicillins, cephalosporins, and macrolides (erythromycins) because they have poor activity against Pasteurella species.
- Post-exposure prophylaxis for 7 days should be considered for persons who had close (<6 feet), sustained contact with a patient with pneumonic plague and were not wearing adequate personal protective equipment.
- The duration of chemoprophylaxis should last until 7 days after the end of the exposure.
- The GDG suggests adding fluoroquinolones (ciprofloxacin, levofloxacin and moxifloxacin) to the first-line medicines recommended for treating pneumonic, septicaemic plague and bubonic plagues. Moxifloxacin and ofloxacin have been recommended for treating plague meningitis. Ciprofloxacin can also be added for postexposure presumptive treatment as alternative for patients who have adverse effects from doxycycline.



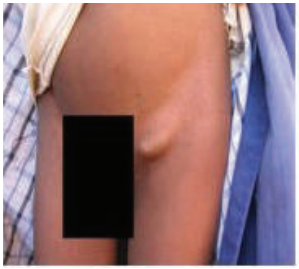
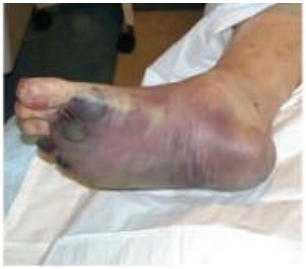
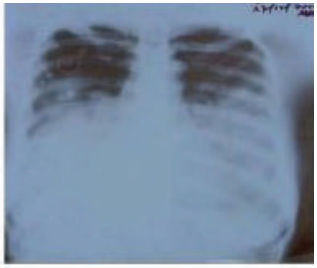
This photograph depicts the colonial morphology displayed by Gram-negative Yersinia pestis bacteria, which was grown on a medium of chocolate agar, for a 72 hour time period, at a temperature of 25°C.

Drug	Dosage	Interval	Route
Streptomycin			
Adults Children	2 g/day 30 mg/kg/day	12	IM
Gentamycin			
Adults Children	5 mg/kg/day 2 mg/kg loading dose followed by 1.7 mg/kg	24 8	IM or IV
Ciprofloxacin			
Adults Children	400 mg, or 500 mg 15 mg/kg (dose should not exceed 1 g/day)	12 12	IV PO IV/PO
Tetracycline			
Adults Children > 9 years	1-2 g/day 25-50 mg/kg/day	6 or 12	PO
Doxycycline			
Adults Children > 9 years	100-200 mg/day	12 or 24	PO
Sulfamethoxazole + Trimethoprim			
Adults Children> 2 years	1.6 g/day* 40 mg/kg/day*	12	PO
Tetracycline			
Adults Children > 9 years	1-2 g/day 25-50 mg/kg/day	6 or 12	PO
Chloramphenicol			
Adults Children (>1) year	50 mg/kg/day	6	PO or IV

Prevention

- Eliminate nesting places for rodents around homes, sheds, garages, and recreation areas by removing brush, rock piles, trash, and excess firewood.
- Avoid picking up or touching dead animals.
- Wear gloves if you must handle sick or dead animals.
- Report sick or dead animals to the local health department or law enforcement officials.
- Do not let pets sleep in the bed with you. This has been shown to increase your risk of getting plague.
- Use insect repellent that contains DEET to prevent flea bites.

A flea infected with yersinia pestis, shown as a dark mass. The foregut of this flea is blocked by a Y. pestis biofilm, which is a prerequisite for efficient transmission..

Plague symptoms depend on how the patient was exposed to the plague bacteria. Plague can take different clinical forms, but the most common are bubonic, pneumonic, and septicemic.

Laboratory Investigation for Confirmation

If plague is suspected, pre-treatment specimens should be taken if possible, but treatment should not be delayed. Specimens should be obtained from appropriate sites for isolating the bacteria, based on the clinical presentation, and may include:

- **Lymph node aspirate:** An affected bubo typically contains numerous organisms that can be evaluated microscopically and by culture.
- **Blood cultures:** Routine blood cultures are a sensitive means of detecting plague. In later stages of disease, levels of bacteraemia are high enough that organisms may occasionally be seen on blood smears.
- **Sputum:** Culture is possible from sputum of very ill patients with pneumonic plague; however, blood is usually culture positive at this time as well.
- **Bronchial/tracheal** wash samples may be taken from patients with suspected pneumonic plague. Throat specimens are not ideal for isolation of Y. pestis since they often contain many other bacteria that can mask the presence of Y. pestis.
- In cases where live organisms are unculturable, lymphoid, spleen, lung, and liver tissue or bone marrow samples may yield evidence of Y. pestis by direct detection methods such as direct fluorescent antibody (DFA) or PCR.

Outbreak Definitions

- A single case of human plague is to be considered an outbreak and a public health emergency, and warrants immediate action.

Suspected Case of Plague
(Bubonic/Septicaemic/Pneumonic)

↓

Immediate verification by the Public Health Officer
(based on history of exposure, clinical signs and symptoms)

↓

Suspected Plague

Immediate notification of district authorities

- Send RRT immediately for conducting epidemiological/ clinical/laboratory investigation
- Activate crisis committee
- Mobilize drugs, vehicles, manpower, finances
- Send laboratory specimen to regional/national laboratories

↓

Laboratory Reports

Positive

- National authorities to notify WHO
- Intensify containment measures
- Information education communication

Negative

- Investigate further to find out cause of outbreak

Immediate institution of containment

- Case management – appropriate antibiotics for 10 days
- Hospitalize all suspect cases
- Active surveillance for new cases
- Chemoprophylaxis to all contacts
- Flea control and sanitation measures in the event of bubonic plague
- Health promotion (public health education)

This silver medal commemorates Hamburg's escape from a plague epidemic in 1714. A flying angel is engraved, armed with a shield protecting the city.

REFERENCES

1. Home :: Integrated Disease Surveillance Programme (IDSP)

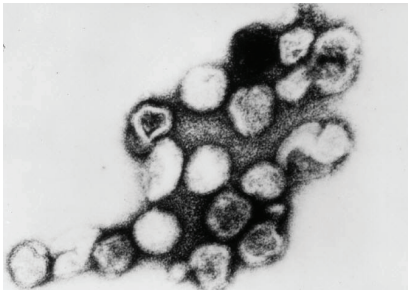
2. https://www.cdc.gov/plague/healthcare/clinicians.html

3. https://www.who.int/news-room/fact-sheets/detail/plague

4. WHO guidelines for plague management: revised recommendations for the use of rapid diagnostic tests, fluoroquinolones for case management and personal protective equipment for prevention of post-mortem transmission, 2021

5. Operational guidelines on plague surveillance, diagnosis, prevention and control. New Delhi: WHO Regional Office for South-East Asia; 2009

Rubella



Transmission electron micrograph of rubella viruses.

Rubella is an acute, contagious viral infection caused by a Toga virus. While rubella virus infection usually causes a mild fever and rash in children and adults, infection during pregnancy, especially during the first trimester, can result in miscarriage, fetal death, stillbirth, or infants with congenital malformations, known as congenital rubella syndrome (CRS).

Mode of Transmission

The virus is transmitted via the respiratory route, and symptoms usually appear 2-3 weeks after exposure. The infectious period in the natural history of illness is 7 days before to 7 days after onset of rash, which disappears after 7-10 days.

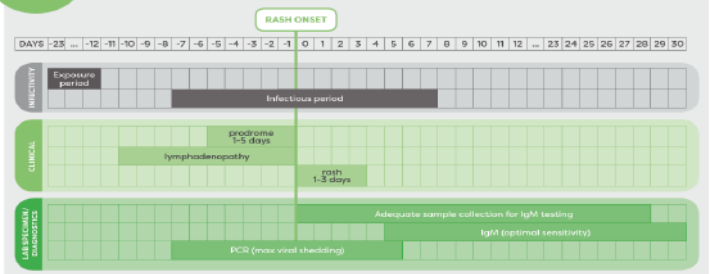
Signs and Symptoms

In children, the disease is usually mild, with symptoms including a rash, low fever (<39°C), nausea and mild conjunctivitis. The rash, which occurs in 50-80% of cases, usually starts on the face and neck before progressing down the body, and lasts 1-3 days. Swollen lymph glands behind the ears and in the neck are the most characteristic clinical feature. Infections in children are less severe and believed to provide lifelong immunity. Infected adults, more commonly women, may develop arthritis and painful joints that usually last from 3-10 days.

Who is at Risk of Infection?

- Anyone who is not vaccinated against Rubella is at risk of getting the disease
- Rubella is very dangerous for a pregnant woman and her developing baby.

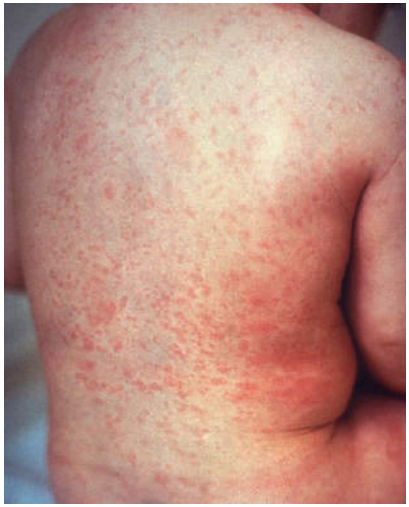
FIGURE 1 **Timeline of infectivity, clinical disease and laboratory findings for rubella virus infection**



Horizontal bars represent range of possible days, with day 0 as the day of rash onset. For lab specimen/diagnostics, bars represent the range of days in which that particular test would be positive.

Complications

- When rubella infection occurs during early pregnancy (first trimester), it can lead to congenital anomalies that may cause death or premature delivery of the fetus resulting in either spontaneous abortions or stillbirths. The post rubella congenital anomalies are usually a complex set of multi-organ involvement known as congenital rubella syndrome (CRS). CRS usually manifests with congenital cataract, congenital glaucoma, congenital deafness, congenital cardiac defects like ventricular septal defects, atrial septal defects, patent ductus arteriosus, hepatosplenomegaly, microcephaly, haematological disorders like purpura and often having mental retardation.
- Arthralgia or arthritis may occur in up to 70% of adult women with rubella.
- Rare complications include thrombocytopenic purpura and encephalitis.



Rash of rubella on skin of child's back. Distribution is similar to that of measles but the lesions are less intensely red.

Diagnosis

Presumptive Case Definition

- A suspected rubella case is any person with fever and maculopapular rash (non-vesicular), OR
- Any person in whom a health worker or clinician suspects rubella infection.

Confirmed Case Definition

A presumptive case with

- Detection of anti-rubella IgM antibody by enzyme immunoassay (EIA), OR
- Rubella virus detection through PCR from throat swab or urine or nasopharyngeal swab, OR
- Isolation of rubella virus, OR

Public Health Measures to be Taken

- **Enhanced case-based surveillance and active case search**
- **Contact Tracing**
- **List of unimmunized /unvaccinated children in the area**
- **Isolation and symptomatic management of cases**
- **Vaccination of susceptible as per GoI guidelines.**

- Direct epidemiologic linkages to a case confirmed by one of the above methods

Note: Virology sample collection within 7 days and serology sample collection within 28 days of onset of rash.

Treatment

- No specific antiviral treatment exists for rubella virus
- Cases can be given symptomatic treatment

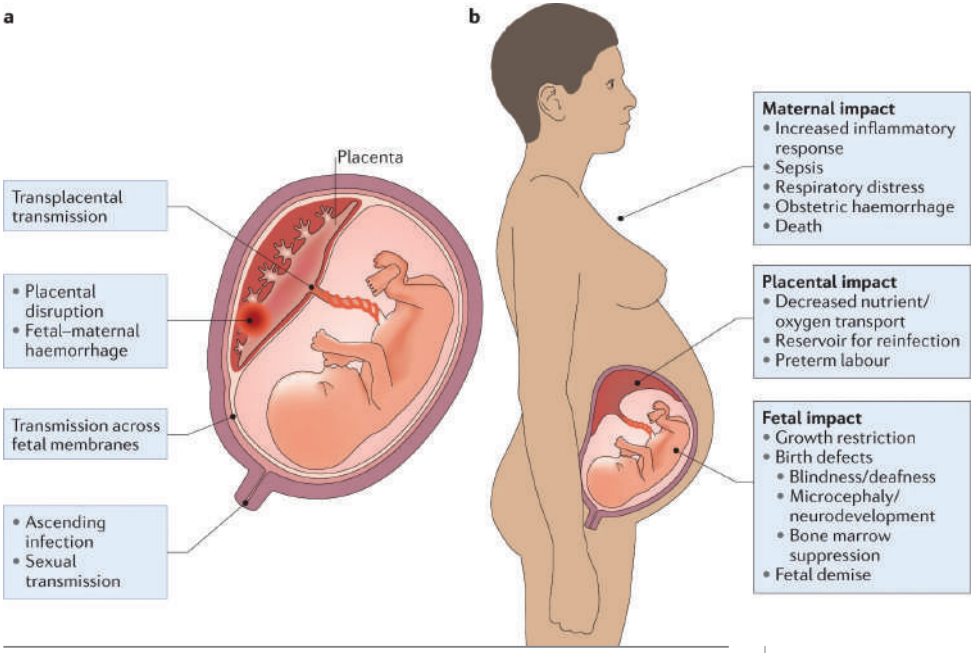
Prevention

- Routine rubella vaccination for children. Two doses of the vaccine are recommended to ensure immunity and prevent outbreaks
- Measles-Rubella vaccine first dose: 9 completed months-12 months (Can be given up to 5 years if not received at 9-12 months of age.
- Measles-Rubella vaccine second dose: 16-24 months
- Dose of both doses: 0.5 ml subcutaneous at right upper arm.

Laboratory Investigation for Confirmation

Type of Specimen	Type of Test	Volume to be Collected	Timing of Collection
Whole blood/ Serum	IgM ELISA	• 5 ml of blood • For infants and younger children, attempt to collect 1 ml of blood (may be collected by foot or finger stick)	Between day 4 and 28 after onset of rash
Throat sample/ Oral Fluid sample	• Viral isolation by cell culture • RT-PCR		Within 14 days of rash onset
Urine		10-50 ml of clean- catch urine specimen	Within 5 days of rash onset

A health worker displays measles vaccine, Navi Mumbai, India

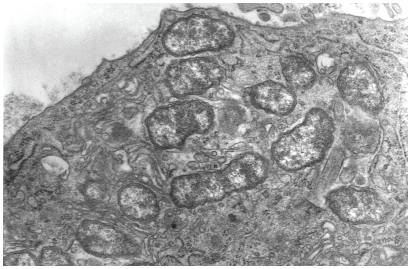


a | TORCH (Toxoplasma gondii, other, rubella virus, cytomegalovirus, herpes simplex virus) pathogens can access the intra-amniotic compartment through multiple mechanisms, including direct transplacental transmission, placental damage or disruption and/or fetal–maternal haemorrhage. In addition, pathogens can be transmitted by ascending the genital tract. b | Infections in pregnancy can affect the maternal host, fetus and/or the placenta itself. The results of infection and the inflammatory response have consequences at each site.

REFERENCES

1. https://www.cdc.gov/rubella
2. https://www.who.int/rubella
3. Manual for the Laboratory-based Surveillance of Measles, Rubella, and Congenital Rubella Syndrome, WHO

Scrub Typhus



A Transmission electron micrograph depicting a peritoneal of a mouse that had been experimentally infected intraperitoneally with Orientia tsutsugamushi rickettsial micro-organisms.

Scrub typhus, also known as bush typhus, is a disease caused by a bacteria called *Orientia tsutsugamushi*. Scrub typhus is the commonest occurring rickettsial infection in India.

Mode of Transmission

The infection is transmitted through the larval mites or "chiggers" belonging to the family Trombiculidae. Only the larval stages take blood meal. A number of small rodents particularly wild rats of subgenus 12 Rattus are natural hosts for scrub typhus.

Signs and Symptoms

Symptoms of scrub typhus usually begin within ten days of being bitten. Signs and symptoms may include: • Fever and chills • Headache • Body aches and muscle pain • A dark, scab-like region at the site of the chigger bite (also known as eschar) • Mental changes, ranging from confusion to coma • Enlarged lymph nodes • Rash.

Complications

Acute respiratory distress syndrome (ARDS), acute renal failure, meningo-encephalitis, multi-organ dysfunction.

Diagnosis

Presumptive Case Definition

Acute undifferentiated febrile illness of 5 days or more (in which common etiologies such as dengue, malaria, and typhoid have been be ruled out)

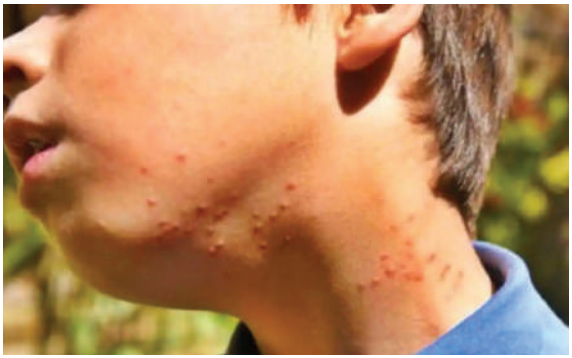
- With or without eschar should be suspected as a case of Rickettsial infection. (If eschar is present, fever of less than 5 days duration should be considered as scrub typhus.)
- Other presenting features may be headache and rash, lymphadenopathy.
- Multi-organ involvement like liver, lung or kidney and encephalopathy in complicated cases. AND/OR
- Titres of 1:80* or above in OXK antigens by Weil Felix test may be an initial indication. A paired serology is advisable (*States can define their significant titre).

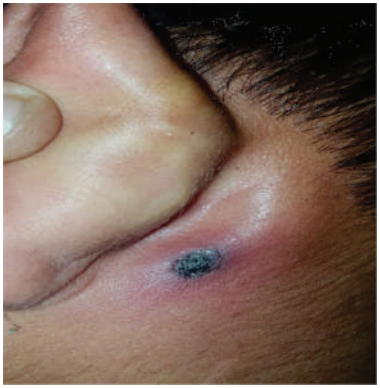
Laboratory Confirmed Case Definition

A case compatible with the clinical description of scrub typhus with at least one of the following:

Who is at Risk of Infection?

Travel to scrub typhus endemic areas or areas with dense vegetation and brush where chiggers may be present.





Eschar is a pathognomonic sign of scrub typhus. It begins as a small-papule at the site of mite-bite, enlarges, undergoes central-necrosis and acquires a black crust with surrounding erythema, resembling a cigarette burn.

- High titre of IgM antibodies in ELISA (evaluated with locally determined cut off) for single clinical sample*.
- A four-fold rise in the Weil-Felix test (total antibodies) between acute and convalescent-phase serum specimens run in parallel.
- Seroconversion on ELISA/ IFAT (demonstrating the conversion of IgM to IgG antibodies).

*A single serum sample showing high titres of IgM antibodies may indicate acute infection.

These 1-3 tests are the preferred tests as ELISA are widely acceptable.

Other: Isolation and Validated PCR can be done in patients who have not received antibiotic and in early stage of diseases (preferably less than seven days).

Over reliance on Rapid Diagnostic Tests (RDT) for Scrub Typhus should be minimized for diagnosis. Instead, the diagnosis should be confirmed as per the tests mentioned above even for cases positive on RDT

Treatment

At primary level

ADULT
- Doxycycline 200 mg/day in 2 divided doses for individuals above 45 kg for duration of 7 days. Patients should be advised to swallow capsules with plenty of fluid during meals while sitting or standing, Or
- Azithromycin 500 mg in a single oral dose for 5 days

CHILDREN
- Doxycycline in the dose of 4.5 mg/kg body weight/day in 2 divided doses for children below 45 kg, Or
- Azithromycin in the single dose of 10 mg/kg body weight for 5 days

PREGNANT WOMEN
- Azithromycin 500 mg in a single dose for 5 days
- Azithromycin is the drug of choice in pregnant women, as doxycycline is contraindicated

Leptotrombidium mite, also known as chigger.

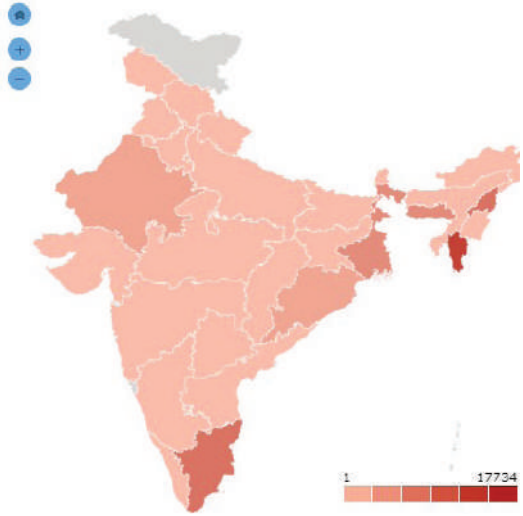
At secondary and tertiary level

The treatment as specified above in uncomplicated cases. In complicated cases the following treatment is to be initiated –

- Intravenous doxycycline (wherever available) 100 mg twice daily in 100 ml normal saline to be administered as infusion over half an hour initially followed by oral therapy to complete 7-15 days of therapy, Or
- Intravenous Azithromycin in the dose of 500 mg IV in 250 ml normal saline over one hour once daily for 1-2 days followed by oral therapy to complete 5 days of therapy, Or
- Intravenous chloramphenicol 50-100 mg/kg/d 6 hourly doses to be administered as infusion over one hour initially followed by oral therapy to complete 7-15 days of therapy.
- Management of the individual complications should be done as per the existing practices.

Prevention

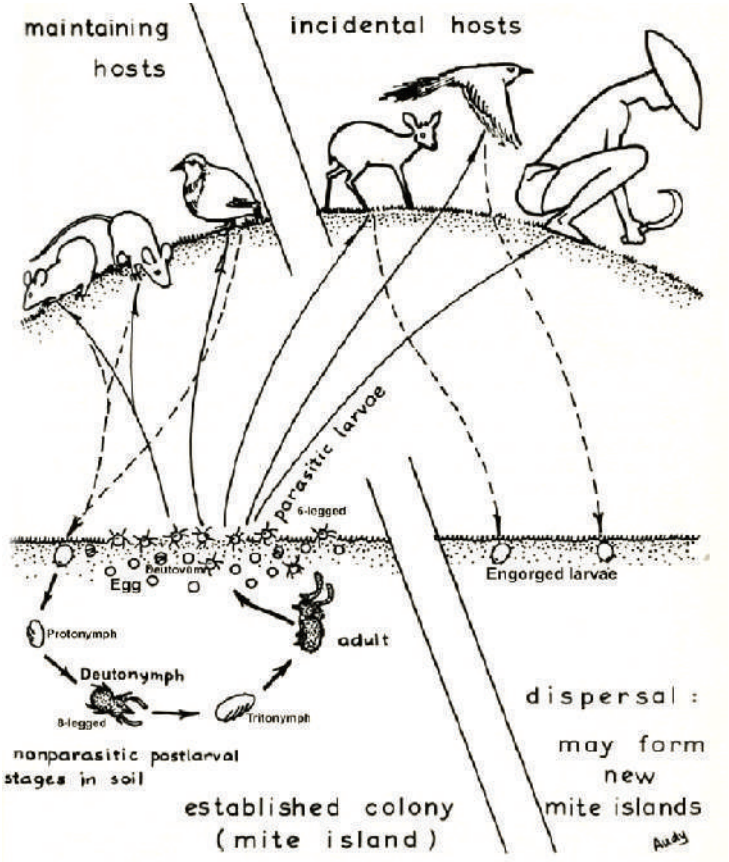
- Vector control by clearing vegetation where rats and mice live and application of insecticides such as lindane or chlordane to ground and vegetation.
- Personal protection measures such as use of miticidal chemicals like benzyl benzoate on clothing and application of mite repellants such as diethyltoluamide to exposed skin surfaces.
- No vaccine is available for scrub typhus presently.



Distribution of Scrub Typhus in India from January 2022- November 2023.

Public Health Measures to be Taken

- **Fever survey and maintain a line list of cases**
- **Symptomatic management of cases**
- **Entomological assessment and Vector Control Measures, including promotion of use of mitecides and mite repellants.**

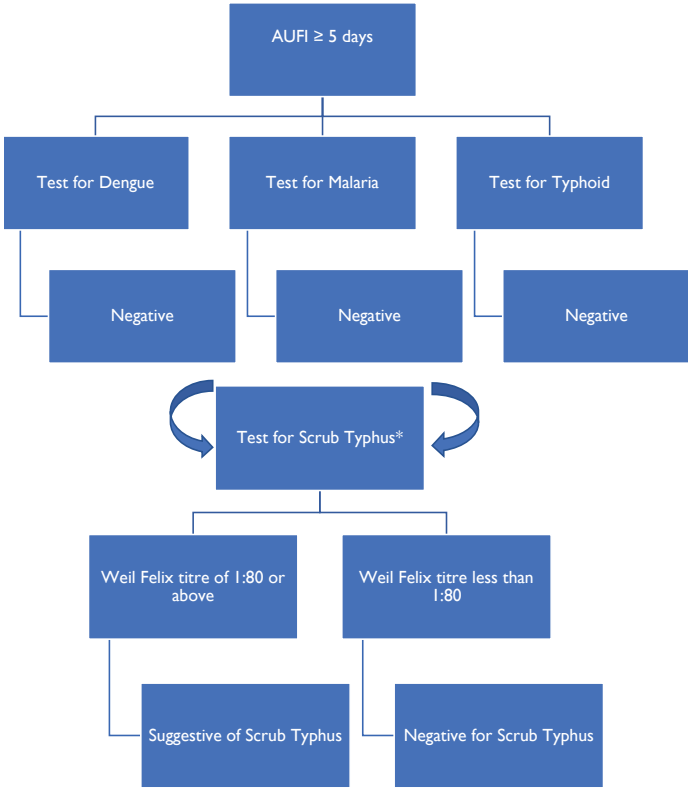


Chigger and scrub typhus life-cycle

Laboratory Investigation for Confirmation

Type of Specimen	Test	Volume	Mode of Collection	Transportation
Serum	IgM Elisa	2 ml	Plain/red/golden topped vacutainer	in cold chain (2-8°C)

Testing algorithm for the diagnosis of Scrub Typhus in a patient with acute undifferentiated febrile illness



*If eschar is present, fever of less than 5 days duration should be considered as scrub typhus

Army scrub typhus control. Burning Kunai grass to destroy mites that transmit scrub typhus

REFERENCES

1. Home :: Integrated Disease Surveillance Programme (IDSP)

2. https://www.cdc.gov/typhus/scrub/index.html#:~:text=Scrub%20typhus%2C%20also%20known%20as,body%20aches%2C%20and%20sometimes%20rash

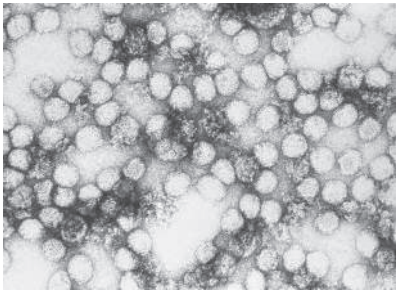
3. https://ncdc.gov.in/WriteReadData/link-images/May%20June-20098604739980.pdf

4. https://main.icmr.nic.in/sites/default/files/guidelines/DHR-sIC-MR%20Guidelines%20on%20Ricketesial%20Diseases.pdf

5. Devasagayam, Emily et al. "The burden of scrub typhus in India: A systematic review." PLoS neglected tropical diseases vol. 15,7 e0009619. 27 Jul. 2021, doi:10.1371/journal.pntd.0009619

6. Algorithm for Zika virus diagnosis, National Institute of Virology, Pune. Available at: https://main.mohfw.gov.in/sites/default/files/73633636501455013085_1.pdf

Yellow Fever



TEM image of yellow fever virus particles.

Yellow fever (YF) is an epidemic-prone mosquito-borne vaccine preventable disease that is transmitted to humans by the bites of infected mosquitoes. The "yellow" in the name refers to the jaundice that affects some patients. The causative agent, *Flavivirus fibricus* formerly classified as a group B arbovirus, is a member of the toga virus family. It shares group-specific antigens with other members of the genus (e.g., West Nile, dengue).

Mode of Transmission

Vector-borne transmission of YF virus occurs via the bite of an infected mosquito, primarily *Aedes* or *Haemagogus* spp. hese day-biting mosquitoes breed around houses (domestic), in forests or jungles (sylvatic), or in both habitats (semi-domestic). YF is a high-impact high-threat disease, with risk of international spread, which represents a potential threat to global health security.

Signs and Symptoms

Many people do not experience symptoms. Those people who are symptomatic, experience symptoms such as fever, muscle pain with prominent backache, headache, loss of appetite, and nausea or vomiting. In most cases, symptoms disappear after three to four days.

Who is at Risk of Infection?

Travelers who visit yellow fever endemic regions are at a higher risk of infection. Forty-seven countries in Africa (34) and Central and South America (13) are either endemic for, or have regions that are endemic for yellow fever.

Complications

Approximately 12% of those infected progress to a more serious form of the disease, characterized by jaundice, hemorrhagic symptoms, and eventually shock and multisystem organ failure. The case-fatality ratio for severe cases is 30-60%.

Yellowing of the skin and eyes.

Diagnosis

Presumptive Case Definition

Any person with:

- Acute onset of fever followed by Jaundice within two weeks of onset of first symptoms, AND

- A history of travel in/transit through a yellow fever affected area within the last six days prior to the development of first symptoms (longest incubation period for yellow fever)
- With or without haemorrhagic manifestations and signs of renal failure.

Detail of a resting female Aedes aegypti yellow fever or dengue mosquito.

Laboratory Confirmed Case

A presumptive case, in the absence of recent yellow fever vaccination and:

- Yellow-fever-specific IgM is found in the serum, OR
- A fourfold or greater rise in IgG levels is found in PAIRED acute and convalescent sera, OR
- Yellow fever virus is isolated in cell culture or laboratory animals, or in case of positive post-mortem liver histopathology, OR
- Yellow fever antigens are detected in tissues by immunohistochemistry, OR
- Yellow fever virus genomic sequences are detected in blood or organs by molecular diagnostic techniques such as Reverse Transcription Polymerase Chain Reaction (RT-PCR).

Treatment

There is no specific treatment for yellow fever, only symptomatic treatment to be provided.

Prevention

Integrated vector control management measures to control mosquito breeding and spread of disease.

- **Vaccination:** Yellow fever vaccine is recommended for people aged nine months or older and who are traveling to or living in areas at risk for yellow fever virus in Africa and South America. Yellow fever vaccine is a live-attenuated preparation of the 17D strain of yellow fever virus which is grown in leucosis-free chick embryos. A single 0.5 ml dose is given subcutaneously and confers lifelong protection against yellow fever. It should be avoided in children less than six months of age and in pregnancy.

Outbreak Definition

Presence of at least one confirmed case of yellow fever in an unvaccinated population is considered an outbreak, in the context of low immunity levels of the population and risk of disease spread.

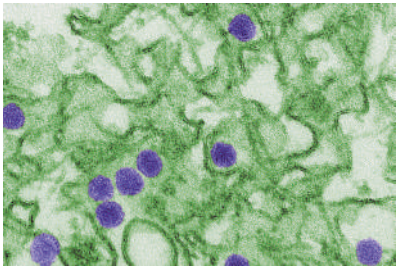
Public Health Measures to be Taken

- **Fever survey and maintain a line list of cases**
- **Symptomatic management of cases**
- **Entomological Assessment and Integrated Vector Control Measures**
- **Vaccination as per GoI guidelines.**

REFERENCES

1. https://wwwnc.cdc.gov/travel/yellowbook/2020/travel-related-infectious-diseases/yellow-fever
2. https://www.who.int/news-room/fact-sheets/detail/yellow-fever#:~:text=Key%20facts,%2C%20nausea%2C%20vomiting%20and%20fatigue
3. IHR POE (mohfw.gov.in)
4. Home :: Integrated Disease Surveillance Programme (IDSP)
5. Yellow fever Outbreak Toolbox (who.int)

Zika Virus



Electron micrograph of Zika virus. Virus particles (digitally colored purple) are 40 nm in diameter, with an outer envelope and a dense inner core.

Zika Virus Disease (ZVD) is a mosquito-borne viral disease caused by Zika virus (ZIKV). Zika virus is carried by infected *Aedes aegypti* mosquitos and is largely transmitted through bites, but can also occur through intrauterine infection.

Mode of Transmission

- ZIKV is transmitted by the bite of infected female Aedes mosquitoes.
- Zika virus is also transmitted from mother to fetus during pregnancy, through sexual contact, transfusion of blood and blood products, and organ transplantation.

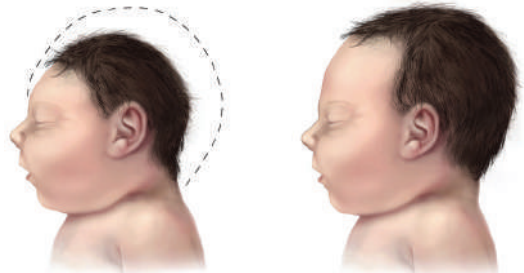
Signs and Symptoms

The incubation period of Zika virus disease is estimated to be 3-14 days. Majority of people infected with Zika virus do not develop symptoms. Symptoms are generally mild including fever, rash, conjunctivitis, muscle and joint pain, malaise, and headache, and usually last for 2-7 days.

Complications

Birth defects like microcephaly, neurologic complications like Guillain-Barré syndrome have been found to be associated with this disease.

Image of a baby with microcephaly (left) compared to a normal baby (right). This is one of the potential effects of Zika virus. Signs of microcephaly may develop a few months after birth.



Diagnosis

Presumptive Case Definition

Any person with skin rash or elevation of body temperature ≥37.2°C with one or more of the following symptoms (not explained by other medical conditions);

- Arthralgia or myalgia
- Non-purulent conjunctivitis or conjunctival hyperemia
- Headache or malaise.

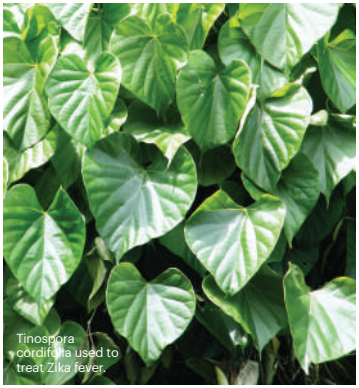
Laboratory Confirmed Case

A presumptive case with laboratory positive result for the specific detection of ZIKV by RT-PCR.

Who is at Risk of Infection?

Zika virus infection in pregnancy has been found to be associated with intrauterine infection of the fetus and microcephaly in babies.


Aedes aegypti mosquito larvae.


Tinospora cordifolia used to treat Zika fever.

Treatment

ZVD is usually relatively mild and requires no specific treatment.
People sick with Zika virus should:

- Get plenty of rest
- Drink plenty of fluids
- Receive symptomatic treatment with acetaminophen (paracetamol) for pain and fever and antihistaminic for pruritic rash.

If symptoms worsen, they should seek medical care and advice. Acetylsalicylic acid and non-steroidal anti-inflammatory drugs are not recommended due to the increased risk of hemorrhagic syndrome described with other arboviruses as dengue.

Prevention

- There is no vaccine against Zika virus disease.
- Integrated vector control measures (anti-larval measures, anti-adult measures and personal protection measures).

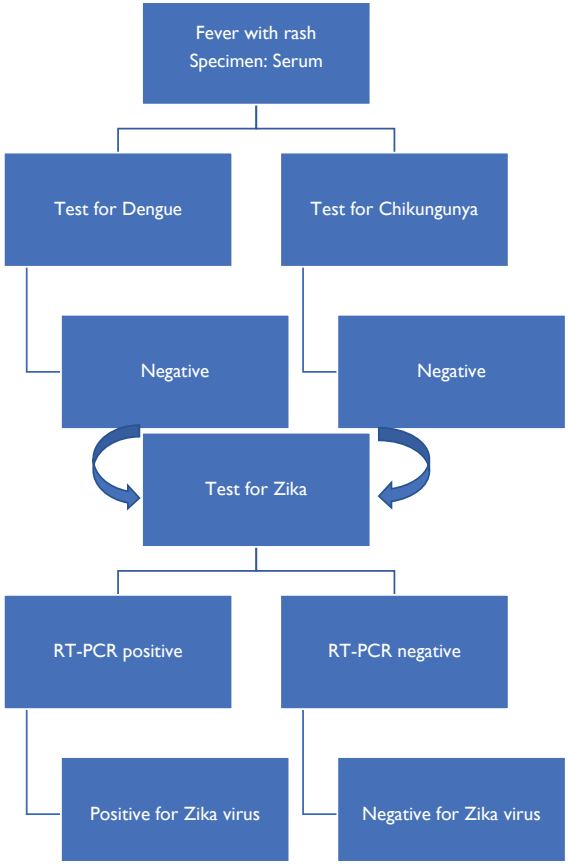
Laboratory Investigation for Confirmation

Type of Specimen	Test	Volume	Mode of Collection	Transportation
Serum	IgM Elisa	2 ml	Plain/red/golden topped vacutainer	in cold chain (2-8°C)

Public Health Measures to be Taken

- Fever survey and maintain a line list of cases
- Symptomatic management of cases
- Entomological assessment and Integrated Vector Control Measures.

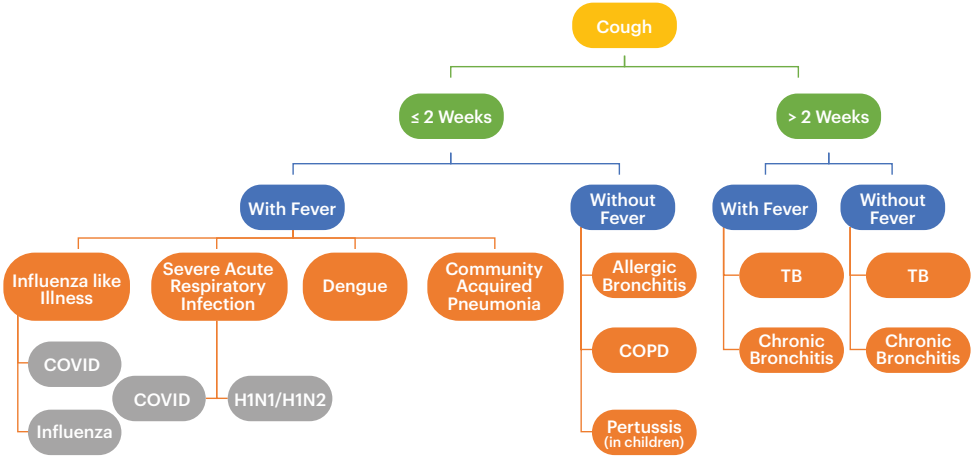
Testing algorithm for the diagnosis of Zika in a patient with fever and rash

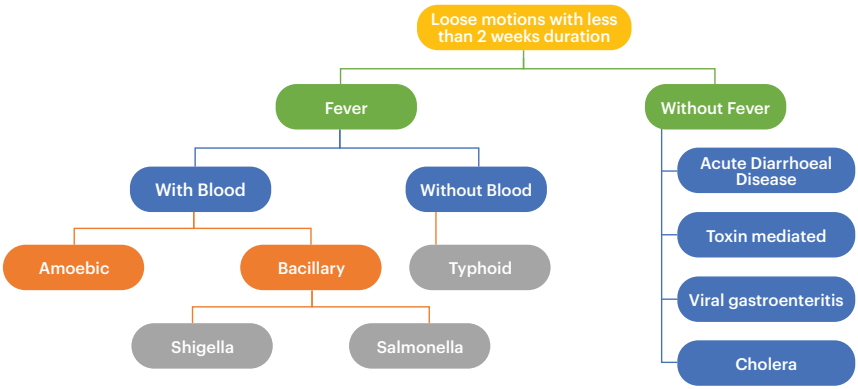


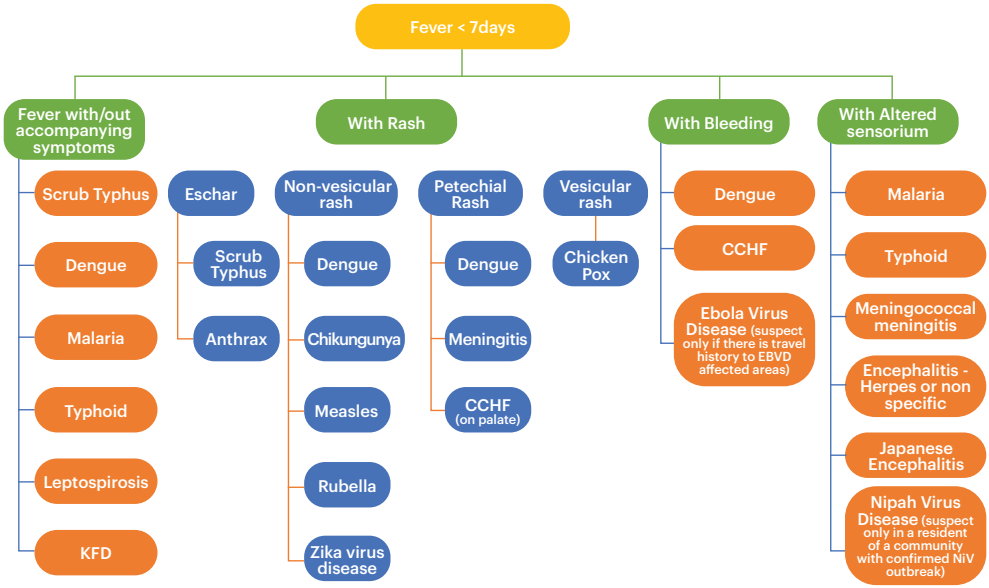
REFERENCES

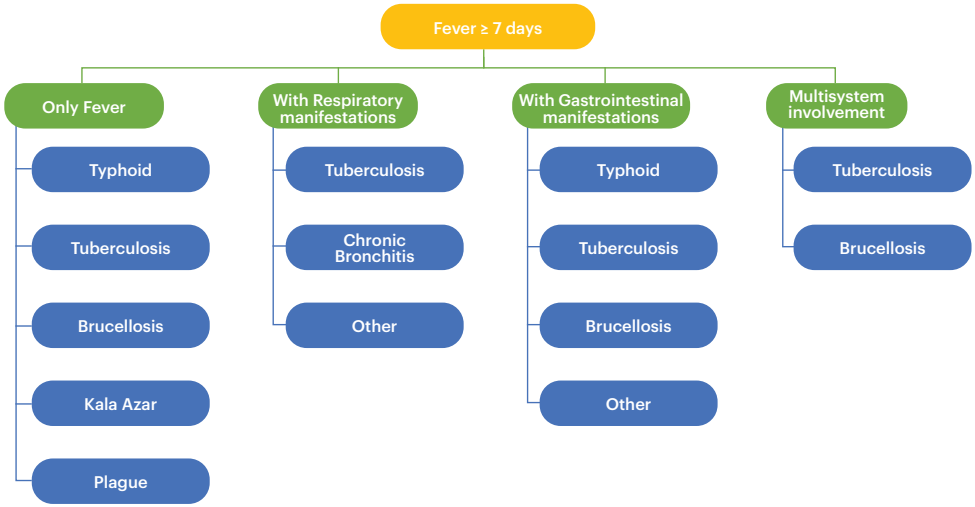
1. Home :: Integrated Disease Surveillance Programme (IDSP)
2. https://ncdc.gov.in/WriteReadData/linkimages/zika_alert9138919266.pdf
3. https://main.mohfw.gov.in/sites/default/files/AnnexuresIFactSheetonZikavirusdisease.pdf
4. https://www.cdc.gov/zika/index.html
5. https://www.who.int/news-room/fact-sheets/detail/zika-virus#:~:text=Zika%20virus%20disease%20is%20caused,last%20for%202%E2%80%937%20days
6. Algorithm for Zika virus diagnosis, National Institute of Virology, Pune. Available at: https://main.mohfw.gov.in/sites/default/files/7363363650 1455013085_1.pdf

Common Differential Diagnosis Associated with the Syndromes






Fever < 7days
Fever with/out accompanying symptoms
Scrub Typhus
Dengue
Malaria
Typhoid
Leptospirosis
KFD
With Rash
Eschar
Scrub Typhus
Anthrax
Non-vesicular rash
Dengue
Chikungunya
Measles
Rubella
Zika virus disease
Petechial Rash
Dengue
Meningitis
CCHF (on palate)
Vesicular rash
Chicken Pox
With Bleeding
Dengue
CCHF
Ebola Virus Disease (suspect only if there is travel history to EBVD affected areas)
With Altered sensorium
Malaria
Typhoid
Meningococcal meningitis
Encephalitis - Herpes or non specific
Japanese Encephalitis
Nipah Virus Disease (suspect only in a resident of a community with confirmed NiV outbreak)


Fever ≥ 7 days
Only Fever
Typhoid
Tuberculosis
Brucellosis
Kala Azar
Plague
With Respiratory manifestations
Tuberculosis
Chronic Bronchitis
Other
With Gastrointestinal manifestations
Typhoid
Tuberculosis
Brucellosis
Other
Multisystem involvement
Tuberculosis
Brucellosis

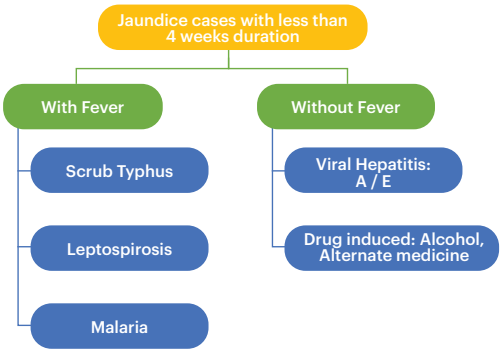

Jaundice cases with less than 4 weeks duration
With Fever
Scrub Typhus
Leptospirosis
Malaria
Without Fever
Viral Hepatitis: A / E
Drug induced: Alcohol, Alternate medicine

Photo Sources

Acute Viral Hepatitis
WIKIMEDIA COMMONS
WIKIPEDIA/CDC
TRADEINDIA.COM

Anthrax
WIKIPEDIA/ARTHUR FRIEDLANDER
MUHSIN ÖZEL, GUDRUN HOLLAND/RKI
WIKIPEDIA/CDC

Brucellosis
WWW.ELSEVIER.ES/EIMC
WWW.ICLINIQ.COM
ILRI/STEVIE MANN/WHO

Chickenpox
WIKIMEDIA COMMONS

Chikungunya
WIKIPEDIA/CDC
NATURE.COM
WIKICOMMONS

Cholera
WIKIMEDIA COMMONS
WIKIPEDIA/CDC

COVID-19
WWW.WOAH.ORG
WIKIPEDIA/CDC

Crimean-Congo Haemorrhagic Fever (CCHF)
WIKIMEDIA COMMONS
WWW.SEMANTICSCHOLAR.ORG
WWW.KHAAMA.COM
WWW.MILLIYET.COM.TR
CDC
WWW.TAIPEITIMES.COM

Dengue
WIKIPEDIA/CDC
WIKIMEDIA COMMONS
PTI
FREEPIK

Diptheria
WIKIPEDIA/CDC
WWW.E4ENT.COM
WIKIPEDIA/IWM
THE HINDU

Ebola
WIKIMEDIA COMMONS
CDC
WIKIPEDIA/CDC

Enteric Fever
WIKIMEDIA COMMONS
WIKIPEDIA/CDC
FREEPIK

Human Rabies
WIKIMEDIA COMMONS
MISSION RABIES

Influenza
CDC
WIKIMEDIA COMMONS
MEDSCAPE
PEXELS
WIKIPEDIA/CDC
WHO/T. PIETRASIK

Japanese Encephalitis
WWW.GAVI.ORG
CDC
JNNP.BMJ.COM
JNNP.BMJ.COM/T SOLOMON
SONAL MATHARU/CSE
WIKIMEDIA COMMONS
WWW.CMAJ.CA
MEDICALNEWSTODAY.COM

Kala-Azar
WHO/TDR/EL-HASSAN
SEMANTICSCHOLAR.ORG
WIKIMEDIA COMMONS
DR D. PANDEY/WHO
NVBDCP.GOV.IN

Kyasanur Forest Disease
CDC
SCROLL.IN
WIKIMEDIA COMMONS

Leptospirosis
WHO/TDR/EL-HASSAN
WIKIMEDIA COMMONS
CDC/DR. MARTIN HICKLIN
PIXABAY

Malaria
WIKIMEDIA COMMONS
WWW.CDC.GOV
IHM.NLM.NIH.GOV/WIKIPEDIA
WHO

Measles
WIKIPEDIA/CDC
WIKIMEDIA COMMONS
UNICEF/INDIA/SUMIT DAYAL

Meningitis
WIKIMEDIA COMMONS
WHO/R. BARRY
WILEY.COM

MERS CoV
NIAID/WIKIMEDIA COMMONS
SPRINGER
WHO/MELINDA FROST

Monkeypox
WIKIMEDIA COMMONS
WIKIPEDIA/CDC
CDC
FREEPIK

Mumps
NIAID/WIKIMEDIA COMMONS
WIKIMEDIA COMMONS
CDC/NIP/BARBARA RICE

Nipah Virus
NIAID/WIKIMEDIA COMMONS
WIKIMEDIA COMMONS
HUB.JHU.EDU
SHIJITH.K/AP
REUTERS/STRINGER
STRINGER/AFP/GETTY IMAGES

Pertussis
A. BARRY DOWSETT/SCIENCE SOURCE
WIKIPEDIA/CDC
WIKIMEDIA COMMONS
MOHFW_INDIA/TWITTER
UNICEF/NARAIN
HULTON DEUTSCH/CORBIS VIA GETTY IMAGES
WIKIPEDIA/CDC

Plague
CDC/WIKIMEDIA COMMONS
WWW.NIAID.NIH.GOV
WIKIPEDIA/WELLCOMELIBRARY
WIKIMEDIA COMMONS

Rubella
CDC/WIKIMEDIA COMMONS
CFP

Scrub Typhus
CDC/WIKIMEDIA COMMONS
DHR-ICMR
NATIONAL MUSEUM OF HEALTH AND MEDICINE/
WIKIMEDIA COMMONS

Yellow Fever
WIKIMEDIA COMMONS
FREEPIK

Zika Virus
CDC/WIKIMEDIA COMMONS
NIAID/WIKIMEDIA COMMONS
WIKIMEDIA COMMONS

Notes

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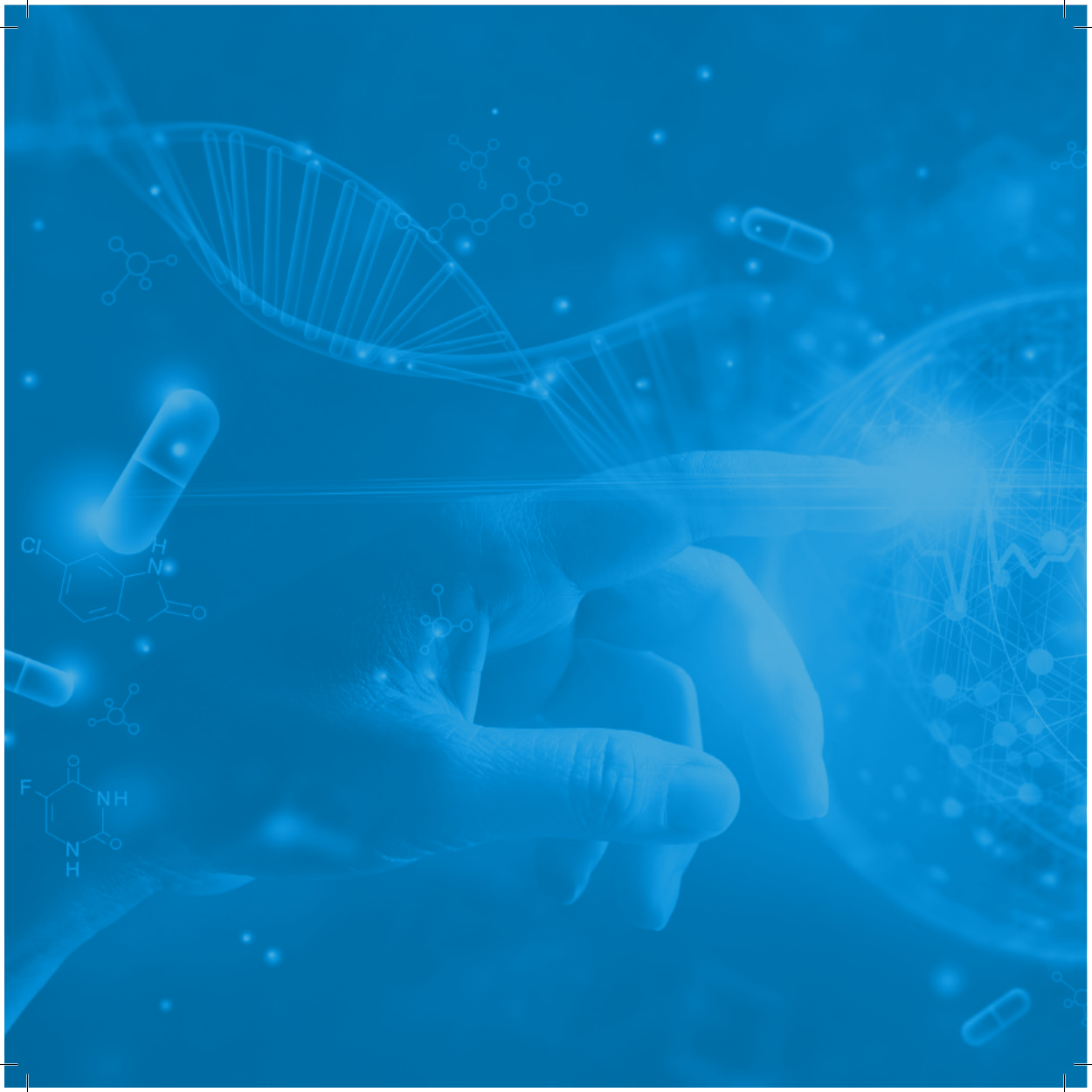
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