PLUTUS IAS

CURRENT AFFAIRS

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MOSQUITO MENACE TO MALARIA-FREE

WHY IN THE NEWS?

India's significant progress in malaria control was highlighted at the Asia Pacific Leaders' Conclave on Malaria Elimination, where Union Health Minister Dr. Mansukh Mandaviya announced that India is the only high-burden, high-impact country in the South-East Asia Region to report a decline in malaria cases in 2020 compared to 2019. Between 2015 and 2022, India witnessed an 85.1% decline in malaria cases and an 83.36% decline in malaria-related deaths, showcasing its strong commitment to malaria elimination. The conclave was attended by health leaders from multiple Asia-Pacific countries and WHO-SEARO representatives, underscoring the importance of regional cooperation in combating malaria.

WHAT IS MALARIA?

Malaria is a life-threatening disease caused by Plasmodium parasites, transmitted to humans through bites of infected female Anopheles mosquitoes. It is prevalent in tropical and subtropical regions and is both preventable and curable. In 2023, there were 263 million malaria cases and 597,000 deaths globally, with the

WHO African Region accounting for 94% of cases and 95% of deaths. Children under five are the most vulnerable, making up 76% of malaria deaths. Symptoms range from fever and chills to severe complications like seizures and breathing difficulty. WHO recommends vaccines like RTS, S/AS01 and R21/Matrix-M for children in high-risk areas. Prevention includes using bed nets, indoor spraying, and antimalarial medicines.

CAUSES OF MALARIA

1. Plasmodium Parasites: Malaria is caused by infection with Plasmodium parasites—mainly P. falciparum (most deadly) and P. vivax (most widespread outside Africa).
2. Mosquito Bites: The disease spreads through bites of infected female Anopheles mosquitoes, primarily active during dusk and dawn.
3. Contaminated Blood Transfusions: Malaria can also be transmitted through the transfusion of infected blood, though this is rare.
4. Shared Needles: Using syringes or needles contaminated with infected blood can spread malaria.
5. Mother to Child: In rare cases, malaria can be transmitted from a pregnant woman to her baby before or during delivery (congenital malaria).
6. Parasite Lifecycle: Once inside the body, parasites travel to the liver, mature, and then infect red blood cells, causing symptoms.
7. Environmental Factors: Stagnant water bodies, poor sanitation, and high humidity create ideal breeding grounds for mosquitoes.
8. Travel to Endemic Areas: People travelling to or living in malaria-prone regions without preventive measures are at higher risk.

ANOPHELES MOSQUITO

The Anopheles mosquito is the primary vector responsible for transmitting malaria to humans. Only female Anopheles mosquitoes can transmit the Plasmodium parasites, as they require blood meals to develop their eggs. These mosquitoes are most active during dusk and dawn and breed in clean, stagnant water sources such as ponds, rice fields, and water storage containers. There are over 400 species of Anopheles, but around 30 are considered major malaria vectors worldwide. One significant species, Anopheles stephensi, originally native to South Asia, is now spreading in urban areas of Africa, posing new challenges to malaria control. Anopheles mosquitoes are also becoming increasingly resistant to common insecticides, making vector control efforts more difficult. Understanding their behaviour and breeding patterns is crucial for implementing effective prevention strategies such as insecticide-treated nets, indoor residual spraying, and larval source management.

SIGNS AND SYMPTOMS

Prevention	Cure
Mosquito Bite Protection:	**Artemisinin-based Combination Therapies (ACTs)**: Most effective for **P. falciparum malaria**.
– **Insecticide-treated nets (ITNs)**: Reduces mosquito bites while sleeping.	**Chloroquine**: Effective for **P. vivax malaria** in areas with no resistance.
– **Mosquito repellents (DEET-based)**: Apply on skin/clothing after dusk to repel mosquitoes.	**Primaquine**: Eliminates liver stages of **P. vivax** and **P. ovale** to prevent relapses.

Prevention	Cure
– **Protective clothing**: Long sleeves/trousers reduce exposure.	**Supportive Care**: IV treatment, fluid management, and blood transfusions for severe cases.
– **Indoor residual spraying (IRS)**: Spraying insecticides inside homes kills mosquitoes.	**Early Diagnosis & Treatment**: Use **rapid diagnostic tests (RDTs)** or **microscopy** for prompt diagnosis.
Environmental Control:	Timely treatment with antimalarial drugs prevents complications and reduces transmission.
– **Larval source management**: Eliminate or treat breeding sites (stagnant water).	
– **Window screens/mesh**: Prevent mosquitoes from entering homes.	
Vaccination:	
– **RTS,S/AS01** and **R21/Matrix-M** vaccines reduce malaria cases, especially in children in endemic areas.	

SIGNS AND SYMPTOMS

Malaria symptoms typically begin 10–15 days after the bite of an infected Anopheles mosquito. Early detection is crucial, as malaria can rapidly progress to severe illness and death, especially in high-risk groups such as children under 5, pregnant women, and people with weakened immunity.

Common Early Symptoms:

1. Fever
2. Chills and shivering
3. Headache
4. Muscle aches and fatigue
5. Nausea and vomiting

Severe Symptoms (Life-threatening stage):

1. Severe fatigue and weakness
2. Impaired consciousness or coma
3. Multiple convulsions
4. Difficulty in breathing
5. Jaundice (yellowing of skin and eyes)
6. Dark or bloody urine
7. Abnormal bleeding and low blood pressure

According to the WHO World Malaria Report 2023, 76% of all malaria deaths in the African Region were among children under five, highlighting the risk of rapid disease progression in vulnerable groups. P. falciparum, the most dangerous malaria parasite, can cause severe symptoms and death within 24 hours if untreated.

CONCLUSION

Malaria remains a significant global health threat, especially in tropical and subtropical regions, but India has made notable strides in reducing its malaria burden. With a remarkable 85.1% decline in cases and an 83.36% reduction in related deaths from 2015 to 2022, India stands as a leader in malaria control in the Southeast Asia region. Efforts like the Asia Pacific Leaders' Conclave on Malaria Elimination underline the importance of regional collaboration. Although progress is being made, malaria continues to affect millions, with children under five being the most vulnerable group. Early diagnosis, preventive measures like insecticide-treated nets, and vaccines such as RTS,S/AS01 and R21/Matrix-M, along with effective treatments like ACTs, are critical in combating the disease. As global efforts intensify, the ongoing fight against malaria remains crucial in achieving long-term health and development goals.

PRELIMS QUESTIONS

Q. Which of the following parasites is responsible for causing malaria in humans?

A. Plasmodium falciparum
B. Plasmodium vivax
C. Plasmodium malariae
D. All of the above

Answer: D

MAINS QUESTIONS

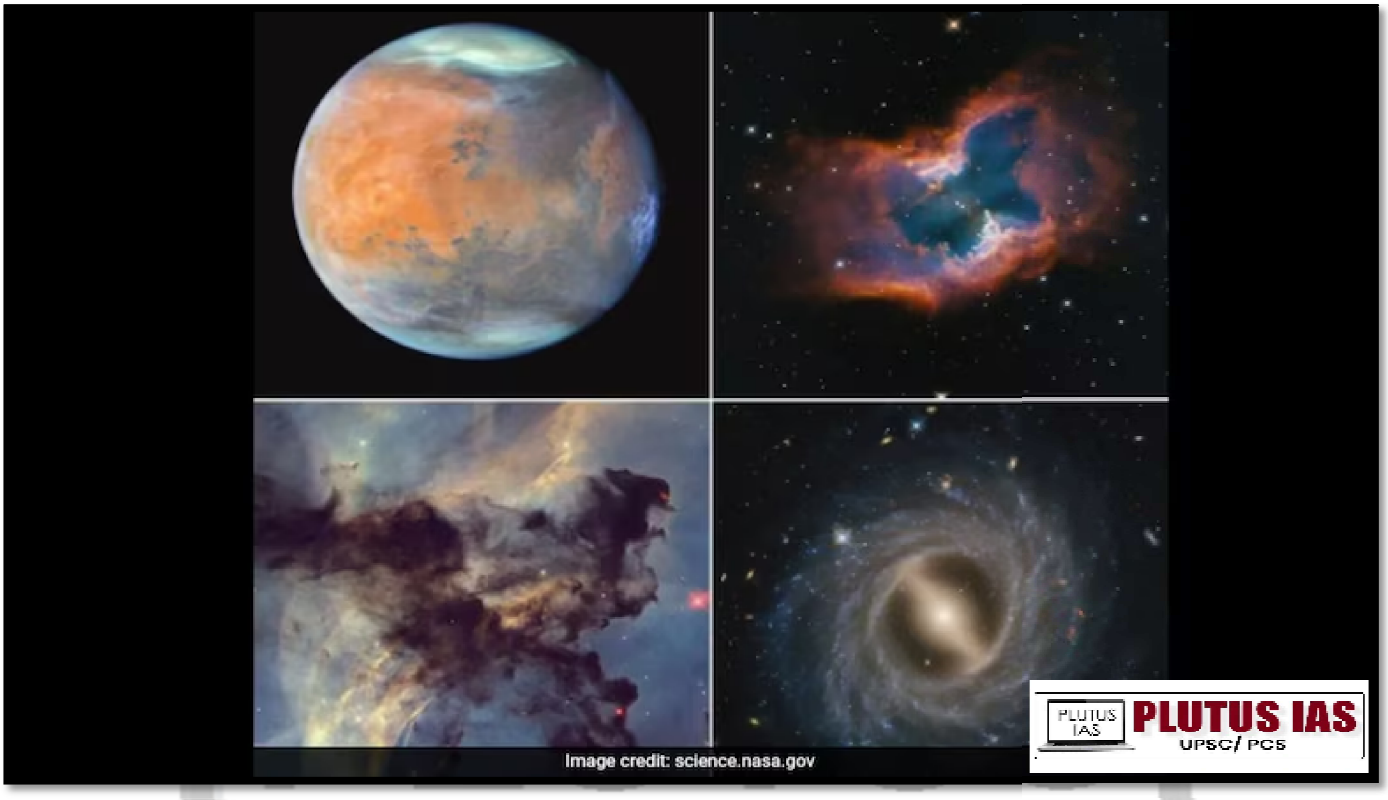
Q. Discuss the various preventive measures and treatment options for malaria. How is India addressing the challenge of malaria elimination, and what progress has been made in recent years?

(250 words, 15 marks)

HUBBLE SPACE TELESCOPE: 35 YEARS OF COSMIC DISCOVERY

WHY IN THE NEWS?

In celebration of the NASA/ESA Hubble Space Telescope's 35 years in Earth orbit, a stunning collection of recent images captured by Hubble has been released. These images showcase a range of celestial phenomena, from detailed views of Mars to striking depictions of stellar birth and death, as well as a magnificent neighbouring galaxy. Hubble's continued success and relevance in space exploration highlight its significant contributions to our understanding of the universe over the past three decades. As one of the most iconic scientific instruments in history, Hubble's imagery continues to inspire and shape our perception of the cosmos. The release of these images marks a milestone in the telescope's legacy, reaffirming its position as a cornerstone of modern astronomical research.



HUBBLE TELESCOPE

The Hubble Space Telescope (HST) is one of the most iconic and influential instruments in the history of astronomy. Launched on April 24, 1990, by NASA aboard the Space Shuttle Discovery (STS-31 mission), it has provided humanity with breathtaking views of space and profound insights into the universe. The Hubble Space Telescope is named after Edwin Hubble, the American astronomer whose work helped establish the concept of an expanding universe.

KEY FEATURES OF THE HUBBLE TELESCOPE

Feature	Details
1. Large Primary Mirror	Size: 2.4 meters (7.9 feet) – Allows Hubble to capture high-resolution images of distant objects.
2. Wide Range of Observations	Observes in UV, visible, and near-infrared wavelengths, enabling it to study various cosmic phenomena.
3. Orbit Above Earth's Atmosphere	Altitude: 547 kilometres (340 miles) – Avoids atmospheric distortion, providing clearer images than ground-based telescopes.
4. High-Resolution Imaging	Achieves a resolution of 0.05 arcseconds, offering incredibly sharp images of distant objects.
5. Significant Discoveries	Helped determine the expansion rate of the universe and contributed to the discovery of dark energy and refined the age of the universe to 13.8 billion years.

Feature	Details
6. The Hubble Deep Field	Captured in 1995, revealed thousands of galaxies in a small patch of sky, providing insight into the early universe.
7. Serviceable in Space	Designed to be serviced and upgraded by astronauts. Five servicing missions between 1993 and 2009 were conducted to install new instruments and fix issues.
8. Data Contributions to Science	1.4 million observations and 15,000 scientific papers published based on Hubble's data, influencing various fields of astrophysics.
9. Lifetime and Legacy	Operational for over 30 years, expected to continue until 2030-2040, maintaining its importance despite the launch of new telescopes like James Webb.

ACHIEVEMENTS OF THE HUBBLE SPACE TELESCOPE

1. Expansion Rate of the Universe: Hubble's observations helped measure the Hubble Constant, refining the expansion rate of the universe. The current value is about 73.3 km/s/Mpc, which is crucial for understanding cosmology.

2. Discovery of Dark Energy: In 1998, Hubble's data helped reveal the existence of dark energy, which accounts for around 68% of the universe, by observing the accelerating expansion of the universe.

3. Determining the Age of the Universe: By studying Cepheid variable stars, Hubble contributed to refining the age of the universe, now calculated to be approximately 13.8 billion years.

4. Hubble Deep Field (HDF): In 1995, Hubble captured the iconic Hubble Deep Field image, revealing thousands of galaxies in a small patch of the sky. This image allowed astronomers to peer back into the 13 billion-year history of the universe.

5. Black Hole Imaging: In 2006, Hubble helped confirm the presence of supermassive black holes at the centres of galaxies, including our own Milky Way, which hosts a 4 million solar mass black hole.

6. Discovery of Exoplanets: Hubble played a significant role in identifying and studying hundreds of exoplanets, contributing to our understanding of planetary atmospheres. Some of these exoplanets have shown signs of water vapour.

7. Tracking the Impact of Comet Shoemaker-Levy 9: In 1994, Hubble provided real-time images of Comet Shoemaker-Levy 9's dramatic collision with Jupiter, giving scientists valuable insights into the effects of planetary impact events.

8. Stellar and Planetary Birth and Death: Hubble captured breathtaking images of stellar nurseries (such as the Eagle Nebula) and supernova remnants, advancing our understanding of stellar life cycles, from birth to death.

CONCLUSION

The Hubble Space Telescope has significantly shaped our understanding of the universe over the past 35 years, producing ground-breaking discoveries and iconic imagery. Despite the advent of newer technologies, its legacy continues to inspire and influence the field of astronomy, underscoring its indispensable role in the exploration of space. Hubble has not only expanded our knowledge of distant galaxies but also paved the way for future space missions, such as the James Webb Space Telescope. As we celebrate its accomplishments, Hubble remains a testament to human ingenuity and the quest to explore the cosmos. Its invaluable contributions will continue to fuel astronomical research for years to come.

PRELIMS QUESTIONS

Q. With reference to the Hubble Space Telescope, consider the following statements:

1. The Hubble Space Telescope was launched in 1990 aboard the Space Shuttle Atlantis.
2. It primarily observes in the infrared and microwave wavelengths.
3. The Hubble Space Telescope has contributed to the discovery of dark energy by observing the accelerating expansion of the universe.

How many of the above-given statements are correct?

A. Only one
B. Only two
C. All three
D. None

Answer: B

MAINS QUESTIONS

Q. Describe the Hubble Space Telescope's design and operational features that allow it to capture high-resolution images and contribute to major scientific discoveries.?

(250 words, 15 marks)