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Institute of Civil Services

DAILY CURRENT AFFAIRS

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S.NO.	TOPIC
1.	IS THERE A TB DRUGS SHORTAGE IN INDIA?
2.	NOBEL PRIZE IN PHYSICS (2023)

IS THERE A TB DRUGS SHORTAGE IN INDIA?

SOURCE: TH, PIB

WHY IN NEWS?

Reports of a shortage of anti-TB drugs in India are deemed false and misleading, with sufficient stocks available for various TB treatment regimens, and procurement processes for the future are in progress under **the National TB Elimination Programme.**

ABOUT TUBERCULOSIS:

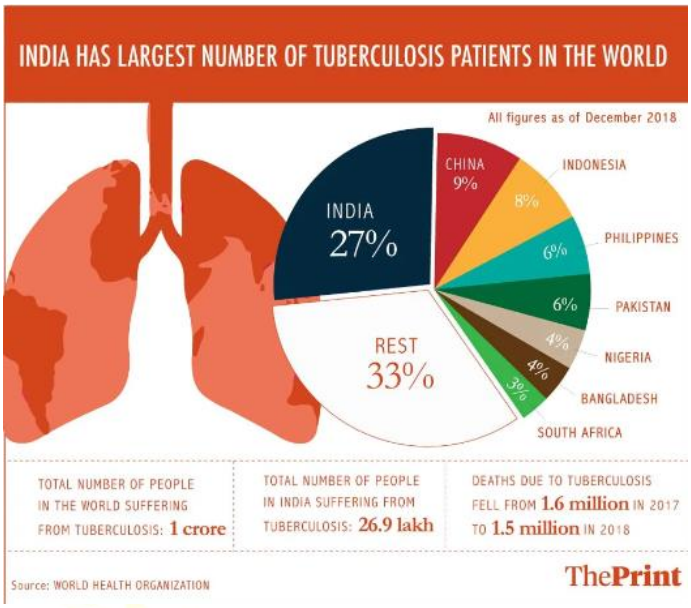
- **ABOUT:** Tuberculosis (TB) is caused by Mycobacterium tuberculosis and primarily affects the lungs (pulmonary TB) but can affect other organs (extra-pulmonary TB).
- **CAUSES:** New TB cases are often linked to five factors: malnutrition, HIV infection, alcohol abuse, smoking, and diabetes.
- **DIAGNOSIS:** TB can be detected through rapid tests, but diagnosing it in children can be challenging.
- **TRANSMISSION:** TB **spreads through the air** and typically presents symptoms like persistent cough, chest pain, weakness, fatigue, weight loss, fever, and night sweats.
- **RISK FACTORS:** Conditions like diabetes, weakened immunity (HIV/AIDS), malnutrition, and tobacco use elevate the risk of TB disease.
- **TREATMENT:** The primary drugs used for treatment are isoniazid and rifampicin, and TB is preventable and curable, with an 85% success rate in treatment.
- **TB BURDEN:**
  - As per WHO data, TB claimed the lives of 1.6 million individuals in 2021, including 187,000 people living with HIV. Globally, TB ranks as the 13th primary cause of death and is the second leading infectious killer, surpassing HIV/AIDS and trailing behind COVID-19.
  - India contributes to over 25% of the total TB cases worldwide.
  - According to the India TB report for 2023, the year 2022 witnessed the notification of 2.42 million cases, marking a 13% increase compared to 2021.

MULTIDRUG-RESISTANT TB (MDR-TB)

- **Overview:** MDR-TB occurs when TB bacteria develop resistance to common medications due to improper usage or premature discontinuation of treatment.
- **Resistance to First-Line Drugs:** MDR-TB does not respond to the standard first-line medications, namely isoniazid and rifampicin.
- **Treatment Approach:** The treatment regimen for Multidrug-Resistant TB typically involves four months of seven drugs (bedaquiline, levofloxacin, clofazimine, isoniazid, ethambutol, pyrazinamide, and ethionamide), followed by an additional five months with four drugs (levofloxacin, clofazimine, pyrazinamide, and ethambutol)
- **Supplementary Medications:** In approximately 30% of individuals with drug-resistant TB, the inclusion of cycloserine and linezolid becomes necessary.

WHY TUBERCULOSIS (TB) REMAINS A SIGNIFICANT ISSUE IN INDIA?

- Tuberculosis spreads faster in urban slums due to poor living conditions and overcrowding.
- Limited knowledge about TB symptoms and treatment delays diagnosis and care.
- In rural areas, access to healthcare is restricted, and treatment quality is poor, exacerbating the TB burden.
- Comorbidities like diabetes, HIV, and malnutrition increase susceptibility to TB, says WHO.
- Inadequate private-sector TB services result in underreporting and subpar treatment outcomes.
- Improper antibiotic use and treatment non-adherence lead to drug-resistant TB, as per The Lancet Infectious Diseases, 2022.
- TB control efforts are hindered by insufficient funding and inadequate policies.



WAY FORWARD:

- Develop a comprehensive TB control program focusing on **early diagnosis**, effective treatment, and follow-up care.
- **Expand healthcare access**, particularly in rural areas with limited availability.
- Prioritize **TB prevention and treatment** through increased funding for research, prevention, and treatment initiatives.
- Implement **targeted prevention programs** for high-risk groups like healthcare workers, HIV-positive individuals, and the homeless.
- Boost **public awareness** through campaigns utilizing mass media, community outreach, and social media.
- **Combat TB-related stigma and discrimination** by working with community leaders, healthcare professionals, and affected individuals.
- **Enhance living conditions**, especially in overcrowded and impoverished areas, to reduce TB transmission risk.
- Invest in research and development to discover new diagnostic tools and more effective TB treatments.
- **Foster international collaboration** with other countries and organizations to share knowledge and resources for TB control.

BACILLE CALMETTE-GUÉRIN (BCG) VACCINE:

BCG, initially **developed by Albert Calmette and Camille Guerin in France,** originated **from a strain of Mycobacterium bovis causing bovine TB** and was **first administered to humans in 1921.**

It was **incorporated into the National TB Control Programme in 1962.**

Besides its primary role as a TB vaccine, **BCG also provides protection against respiratory and bacterial infections in newborns and other mycobacterial diseases such as Leprosy and Buruli's ulcer.**

- **Notably, BCG exhibits varying effectiveness in different geographic regions, with greater efficacy observed farther from the equator. It is highly effective in countries like the UK, Norway, Sweden, and Denmark but shows limited or no efficacy in equatorial nations like India, Kenya, and Malawi, despite higher TB burdens.**

GOVERNMENT INITIATIVES TO TACKEL TB:

INITIATIVE	OBJECTIVES AND DETAILS
NATIONAL TB ELIMINATION PROGRAMME	Aims to achieve TB epidemic elimination in India by 2025, five years ahead of the SDG target for 2030.
AYUSHMAN BHARAT DIGITAL HEALTH MISSION	Utilizes technology to provide digital health IDs for TB patients, facilitating proper diagnostics and treatment.
NI-KSHAY POSHAN YOJANA	Offers financial support through direct benefit transfer to TB patients.
PRADHAN MANTRI TB MUKT BHARAT ABHIYAN	An MOHFW initiative to accelerate TB elimination in India by 2025, enhancing treatment outcomes.
TB MUKT GRAM PANCHAYAT ABHIYAAN	Engages communities in TB elimination efforts, with TB Champions identified and educated at the Panchayat level.
TUBERCULOSIS MODEL	India's mathematical model for improved disease estimation and timely data availability, including state-level estimates.

BPaL regimen Trial:

- In the trial for tuberculosis, a modified BPaL regimen demonstrated a cure rate exceeding 85%.
- The **BPaL regimen is a six-month, entirely oral, three-drug treatment protocol designed for individuals afflicted with highly drug-resistant strains of TB, notably extensively drug-resistant TB (XDR TB).**
- This regimen comprises three antibiotics: pretomanid, bedaquiline, and linezolid.
- XDR TB represents a rare subtype of multidrug-resistant tuberculosis (MDR TB) characterized by resistance to isoniazid, rifampin, a fluoroquinolone, and a second-line injectable medication (such as amikacin, capreomycin, and kanamycin).

NOBEL PRIZE IN PHYSICS (2023)

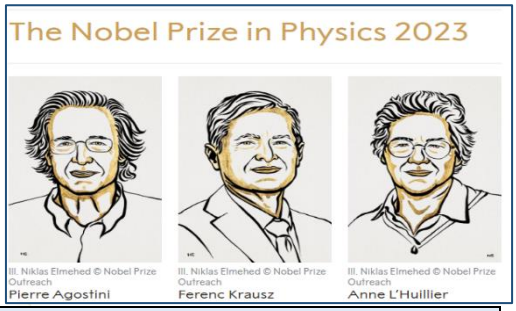
Source: THE HINDU , LIVEMINT

WHY IN NEWS?

- **France's Pierre Agostini**, **Hungarian Austrian Ferenc Krausz** and **French Swedish Anne L' Huillier** won the Nobel Prize in Physics for research **using ultraquick light flashes that enable the study of electrons inside atoms and molecules.**
- In 2022, the Nobel Prize in Physics was awarded to **John F. Clauser, Alain Aspect and Anton Zeilinger** for their work in **quantum mechanics** by the Royal Swedish Academy of Sciences.

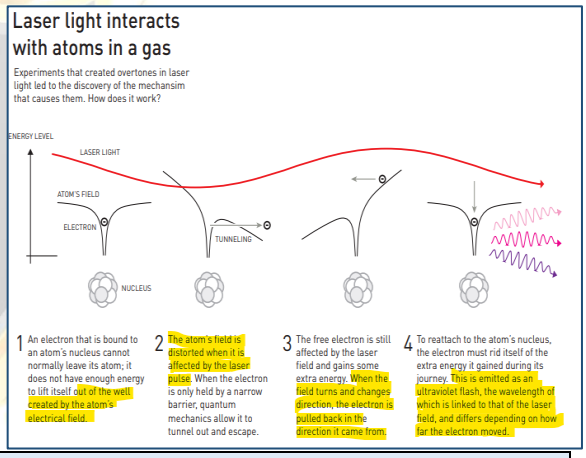
KEY HIGHLIGHTS:

- **Laureates:** France's **Pierre Agostini**, Hungarian **Austrian Ferenc Krausz** and French Swedish **Anne L' Huillier.**
- **Awarded by:** The ***Royal Swedish Academy of Science***.
- **Citation:** "for experimental methods that generate attosecond pulses of light for the study of electron dynamics in matter".



UNDERSTANDING THE CONCEPT:

- Fast events in **electron dynamics occur** within **attoseconds** (billionths of a billionth of a second).
- **Attosecond pulses of light are ultra-short bursts of light** measured in attoseconds.
- These pulses **capture electron processes** inside atoms and molecules.
- ***Attosecond physics*** enables us to **understand processes and mechanisms that are governed by electrons**, which are fundamental particles in atoms and molecules.



THE LAUREATES' CONTRIBUTIONS:

- **Anne L'Huillier's Discovery (1987)**
  - ✓ She observed different **overtones of light** when **passing infrared laser light through a noble gas.**
  - ✓ Each overtone is a **light wave resulting from laser light interacting with gas atoms**.
  - ✓ It provides **electrons extra energy, emitted as light**.
  - ✓ Her discovery paved the way for future breakthroughs.
- **Pierre Agostini's Contribution (2001)**
  - ✓ Produced and investigated **consecutive light pulses, each lasting 250 attoseconds**.
- **Ferenc Krausz's Contribution (2001)**
  - ✓ Developed experiments **to isolate single light pulses lasting 650 attoseconds**.

NOBEL PRIZE IN INDIA FOR PHYSICS:

Nobel Prize	Concept	Contribution
C.V. RAMAN	Discovery of the Raman Effect, **which involves the scattering of light by**	Laid the foundation for the field of **Raman spectroscopy, used in chemistry**, material

(1930)	**molecules,** leading to changes in its wavelength.	science, and biology.
SUBRAHMANYAN CHANDRASEKHAR (1983)	Work on the structure and **evolution of stars, introducing the "Chandrasekhar limit**" for white dwarf stars.	Pivotal in **astrophysics, contributing to our understanding of stellar evolution**, black holes, and massive stars.
VENKATRAMAN RAMAKRISHNAN (2009)	Research in **X-ray crystallography to determine the structure and function of the ribosome.**	Implications in understanding **fundamental biological processes and the development of antibiotics**.

WAY FORWARD:

- India continues to **invest in research in physics and related fields**, with institutions like the **Tata Institute of Fundamental Research (TIFR)** and **the Bhabha Atomic Research Centre (BARC)** conducting cutting-edge research**.**
- **Collaborations with international institutions** and participation in global experiments remain a focus of India's scientific community.
- Indian scientists have also made significant contributions to international collaborations, such as those in **particle physics and astrophysics**. For example, **India is a member of CERN (the European Organization for Nuclear Research)** and plays a **role in experiments like those conducted at the Large Hadron Collider (LHC).**

PRELIMS-SPECIFIC

Understanding Quantum Mechanics and Quantum Entanglement (NOBEL PRIZE 2022)

Classical vs. Quantum Mechanics

- ✓ Mechanics is a branch of physics that studies **the movement and interactions of objects**.
- ✓ Classical mechanics **deals with macroscopic objects and their motion**, described by Newtonian principles.

What is Quantum Mechanics?

- ✓ Quantum mechanics is a **subfield of physics focused on particles like atoms, electrons, and photons in the molecular and sub molecular realm**.

What is Quantum Entanglement?

- ✓ It is a phenomenon where **two subatomic particles share complementary properties, regardless of distance.**
- ✓ When one **particle's properties are measured**, it **instantaneously determines the properties of the other particle.**
- ✓ his concept was first explained by **Erwin Schrödinger in 1935**, famously linked to the **Schrödinger's cat paradox.**

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q. Who among the following scientists shared the Nobel Prize in Physics with his son? (2008)
(a) Max Planck
(b) Albert Einstein
(c) William Henry Bragg
(d) Enrico Fermi
Ans: (c)

Q. Nobel Prize winning scientist James D. Watson is known for his work in which area? (2008)
(a) Metallurgy
(b) Meteorology
(c) Environmental protection
(d) Genetics
Ans: (d)

Mains

Q1. The Nobel Prize in Physics of 2014 was jointly awarded to Akasaki, Amano and Nakamura for the invention of Blue LEDs in the 1990s. How has this invention impacted the everyday life of human beings? **(2021)**

Q2. Discuss the work of 'Bose-Einstein Statistics' done by Prof. Satyendra Nath Bose and show how it revolutionized the field of Physics. **(2018)**