

Constant mechanical force may be why heart cancer is so rare

Prelims: General Studies Paper - 1
General Science.

Mains: General Studies - 3

Awareness in the fields of IT, Space, Computers, robotics, nano-technology, bio-technology and issues relating to intellectual property rights.

1. Why Heart Tumours Are Rare

- The **human heart beats more than 1 lakh times daily**, constantly creating strong **mechanical forces**.
- Although **cancer cells travel through the bloodstream**, tumours in the heart are **extremely rare**.
- Earlier explanations focused on **genetics, immunity, and heart-cell biology**, but they could not fully explain this phenomenon.
- A new study published in the journal **Science** suggests that the **force generated by heartbeats itself suppresses cancer growth**.

2. Key Experiments and Findings

- Researchers introduced **cancer-causing mutations** in mice; tumours appeared in many organs but **not in the heart**.
- Scientists implanted a **second “unloaded” heart** into mice:
 - ➔ It **remained alive and beating**.
 - ➔ But it did not experience the normal **mechanical stress** of pumping blood.
- In these unloaded hearts:
 - ➔ **Cancer cells grew rapidly**.
 - ➔ Some occupied **large parts of the tissue**.
- Lab-grown beating heart tissues showed the same pattern:

- ➔ **Reduced mechanical activity** → easier cancer growth.
- ➔ **Active contractions** → restricted cancer proliferation.

3. How Heartbeats Suppress Cancer

- Each heartbeat creates **compressive mechanical forces** that cells must withstand.
- These forces create a **hostile environment for cancer cells**, limiting their multiplication.
- Mechanical stress affects the cell's **chromatin** (packaged DNA):
 - ➔ DNA regions linked to **slowing cell division** became more accessible.
 - ➔ Signs of **rapid cancer growth decreased**.
- Researchers found that these forces travel through:
 - ➔ The **cytoskeleton** (cell's internal framework).
 - ➔ **Proteins connecting the cytoskeleton to the nucleus**.
- This means the heartbeat's physical stress can directly influence:
 - ➔ **DNA organisation**
 - ➔ **Gene expression**
 - ➔ **Cancer-cell behaviour**

4. Broader Significance and Limitations

- Scientists believe similar effects may occur in other organs exposed to:
 - ➔ **Stretching**
 - ➔ **Compression**
 - ➔ **Physical strain**
- Experts noted that **mechanical signals already guide heart and blood-vessel function**.
- The study helps explain why **heart cancers rarely develop**.

- However, researchers cautioned that:
 - ➔ In some cases, mechanical signals can also **promote tumour growth and metastasis**.
 - ➔ More research is needed to identify **which physical signals suppress cancer and which encourage it**.

A **Current Account Deficit (CAD)** is a situation where a country's **total imports of goods, services, and income payments exceed its total exports and foreign inflows**,

Why is the Prime Minister advocating austerity?

Prelims: General Studies Paper - 1
Current events of national and international importance

Mains: General Studies - 2
Government policies and interventions for development in various sectors and issues arising out of their design and implementation

1. Context

- The Prime Minister urged economic restraint due to the global shock from the West Asia war.
- Aim: reduce imports of oil, gold, and fertilizers to protect India's external sector.
- Seven-point advisory (May 10, Secunderabad): **work from home, cut fuel use, use public transport/ EVs, reduce cooking oil, pause gold buying, prefer domestic goods, avoid foreign travel, adopt natural fertilizers**.
- The opposition criticised the timing of the post-elections.

2. Reasons for Economic Stress

- The global energy crisis pushed **Brent crude oil prices from about \$65 to around \$110/barrel**.
- India imports **85-90% of oil**; Oil constitutes about **17% of India's total goods imports**, significantly impacting the import bill.
- Gold prices rose **45-60%**, but import demand fell only marginally (roughly 5%), while value rose **24%**.
- Rupee depreciated from **₹85/\$ to around ₹96/\$**.
- Forex reserves fell from **\$581.4 bn to \$552.4 bn** (~\$29 bn drop).
- **FII(Foreign Institutional Investment)** outflows increased dollar pressure.
- **CAD (Current Account Deficit)** is projected to rise to **about 2.5% of GDP** (from 1.4%).

3. Government Measures

- Gold/silver import duty doubled to **18.4%**; silver imports restricted.
- Fuel price hikes: **+₹3/litre (petrol/diesel), +₹2/kg (CNG)**.
- Estimated additional revenue: **₹4,400 crore/month**, though losses remain around **₹1,000 crore/day** for oil companies.
- Symbolic austerity: reduced ministerial convoys.

4. Effectiveness and Limitations

- Fuel hikes may curb demand but are **inflationary**.
- Work-from-home advice has limited practical impact.
- Higher gold duties may **increase smuggling** (as in 2013).
- Natural fertilizers: beneficial long-term but **risk short-term output loss**, especially with weak monsoon/El Niño.
- Public transport may become costlier.
- Foreign spending is driven more by **overseas investments than travel**.
- Measures offer **limited short-term relief**; core issue remains weak exports and low dollar inflows.
- Way forward : **boosting export competitiveness, diversifying energy sources, strengthening domestic manufacturing, and enhancing dollar inflows through services and investment**.

Why has RSS called for dialogue with Pakistan?

Prelims: General Studies Paper - 1
Current events of national and international importance

Mains: General Studies - 2
Bilateral, regional and global groupings and agreements involving India and/or affecting India's interests.

1. Why the Issue Became Important

- **RSS leader Dattatreya Hosabale** recently said India should continue attempts at **dialogue with Pakistan**.
- His remarks gained attention because they came soon after the anniversary of **Operation Sindoor** and the **2025 Pahalgam terror attack**.
- The **Modi government** has consistently maintained that **talks cannot happen alongside terrorism**.
- Therefore, many questioned whether the statement was giving the government **political space to restart engagement with Pakistan**.

2. RSS Position on Pakistan

- The **RSS** says its position is based on its **long-term ideological beliefs**, not immediate politics.
- Hosabale clarified that:
 - ➔ There is **no trust in Pakistan's political and military leadership**.
 - ➔ But **people-to-people relations** remain important.
- RSS leaders believe India and Pakistan share:
 - ➔ **Historical**
 - ➔ **Cultural**
 - ➔ **Civilisational connections**.

3. Historical Background of RSS Views

- In **1964**, **Deendayal Upadhyaya** and **Ram Manohar Lohia** supported the idea that India-Pakistan division was based on **artificial grounds**.
- The RSS idea of **Akhand Bharat** (undivided Indian subcontinent) also influenced this thinking.
- In **2015** and **2017**, RSS leaders again stressed:
 - ➔ India and neighbouring countries are like a **shared family**.
 - ➔ **Relations may worsen temporarily**, but **engagement should continue**.

4. Reactions and Political Significance

- **Pakistan** welcomed the remarks as a **positive development**.

- Leaders in **Jammu & Kashmir**, including **Farooq Abdullah** and **Mehbooba Mufti**, supported dialogue.
- Former Army Chief **Gen. Manoj Naravane** also viewed it positively.
- The **Congress Party** questioned what had changed after the **Pahalgam attack**.
- **RSS views** do not directly determine the policies of the Union government.
- However, whenever or if ever PM **Narendra Modi** seeks to initiate dialogue with Pakistan, he is likely to receive **political and ideological backing from the RSS**, the ideological parent of the BJP.

Why has Air India cut international flight operations?

Prelims: General Studies Paper - 1
Current events of national and international importance

Mains: General Studies - 3
Infrastructure: Energy, Ports, Roads, Airports, Railways etc.

1. Context

- Air India announced major international schedule cuts between June and August, including a nearly 40% reduction in North America operations and significant cuts across **SAARC (South Asian Association for Regional Cooperation)** and Southeast Asia.
- Overall, **145 weekly international flights** have been removed, leading to a **27% reduction in total international operations**.

2. Routes and Extent of Cuts

- **North America:** Flights reduced from **51 to 33 per week (39% decline)**; routes like **Delhi-Chicago, Delhi-Newark, Mumbai-New York** suspended, though **Mumbai-Newark increased to 7 weekly flights**.
- **Europe:** About **34% reduction** on routes to **Paris, Copenhagen, Milan, Vienna, Zurich, and Rome**, while **London, Manchester, Amsterdam remain unaffected**.
- **Southeast Asia, SAARC, Far East:** Sharpest cuts of about **57%**, affecting **Kathmandu, Dhaka, Colombo, Bangkok, Shanghai, Singapore, Kuala Lumpur, Ho Chi Minh City; 21 weekly Singapore flights withdrawn**.
- **Australia:** **Delhi-Melbourne and Delhi-Sydney** reduced from **7 to 4 weekly flights**.

3. Reasons for the Cuts

- **West Asia conflict** forced airlines to avoid affected airspace, increasing travel time to North America by **5-6 hours**.
- Airlines now require **refuelling stops (Vienna, Copenhagen)** due to longer routes.
- **Pakistan airspace ban (post Operation Sindoor, April 2025)** further disadvantages Indian carriers compared to European airlines like Lufthansa.
- **Jet fuel prices rose by 130%**, with fuel forming **nearly 40% of operating costs**.
- Air India incurred a loss of **₹26,700 crore in FY2025–26**, prompting network rationalisation.
- Additional factor: **reduced passenger confidence** after the **Ahmedabad crash (June 12 last year)**.

4. Wider Impact and Global Trends

- Other Indian airlines also affected: **IndiGo (-21% international flights)**; **SpiceJet, Akasa Air, Air India Express (>50% cuts)** though on smaller networks.
- Air India was most impacted due to dominance in **North America and Europe routes**.
- Gulf carriers saw **61% decline in international passenger traffic (March)** as per IATA.
- **Lufthansa Group** cancelled **20,000 short-haul flights** to save fuel and improve efficiency.
- **Qantas** reduced **domestic capacity by 5% and international flights by 2%**, while withdrawing **Bengaluru-Sydney service**.
- Rising fares due to fuel surcharges may **reduce passenger demand**, worsening airline finances.
- Way forward : **diversifying flight routes, improving fuel efficiency, strengthening regional connectivity, and enhancing resilience through better geopolitical risk management**.

KEYWORDS

Captagon

- **Captagon** is a highly dangerous **synthetic stimulant** associated with **amphetamine-type psychotropic substances**.
- The drug is known for **keeping users awake for extended periods, reducing fatigue, enhancing alertness, and inducing aggressive behaviour**.
- In a first-of-its-kind crackdown in India, the **Narcotics Control Bureau (NCB)** seized nearly **227.7 kg of Captagon** during a major international anti-drug operation called **Operation RAGEPILL on 16 May**.

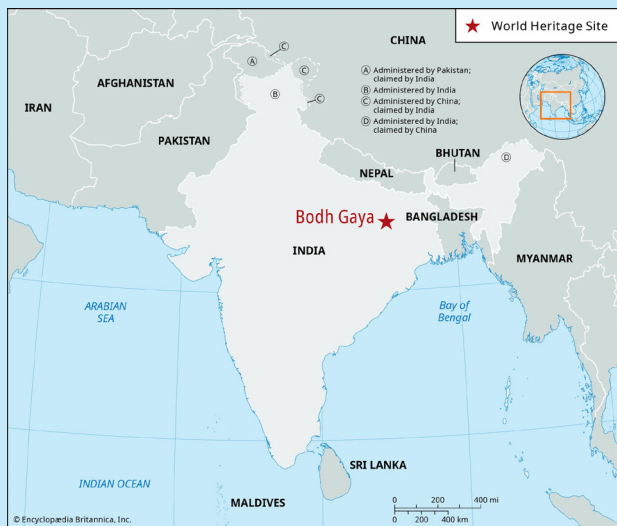
Places In News

Mahabodhi Temple Complex, Bodh Gaya, Bihar



- The Mahabodhi Temple Complex in Bodh Gaya is a **UNESCO World Heritage Site and one of the four most sacred places associated with the life of Lord Buddha**.
- It marks the **exact location where he attained enlightenment in 531 BC** under the Bodhi Tree.
- The earliest shrine at the site was constructed by **Emperor Ashoka** in the **3rd century BCE**, while the existing temple structure dates back to the **5th-6th centuries CE**.
- Built entirely of **brick**, it is among the **earliest surviving Buddhist temples** from the **late Gupta period** and greatly influenced the evolution of **brick architecture** in later centuries.

- The present-day **Mahabodhi Temple Complex** at **Bodh Gaya** includes:
 - ➔ The majestic **50-metre-high main temple**
 - ➔ The **Vajrasana (Diamond Throne)**
 - ➔ The sacred **Bodhi Tree**, and **six other sacred sites** linked to Buddha’s enlightenment.
- The complex is encircled by numerous **ancient votive stupas** and protected through **inner, middle, and outer circular boundaries**.
- A **seventh sacred site**, the **Lotus Pond**, lies just outside the southern enclosure.



Species in news

Barn Swallow (*Hirundo rustica*)

- The **Barn Swallow (*Hirundo rustica*)**, traditionally a **winter visitor to India**, has shown a **recent evolutionary shift in Manipur (Imphal Valley)** with the emergence of a **resident breeding population**, indicating **behavioral adaptation** from migration to settlement.
- It is a **“synanthropic species”**, living in **close association with humans** and building **cup-shaped mud nests on man-made structures** such as barns, bridges, and house eaves.
- It is among the **most widespread migratory birds**, breeding in the **Northern Hemisphere (North America, Europe, Asia)** and migrating to the **Southern Hemisphere (South Asia, Sub-Saharan Africa, South America)**.
- It is an **aerial insectivore**, feeding on **flying insects**, making it an important **bio-indicator of ecosystem health** and aiding in **natural pest control**.
- Despite **localized declines** due to **habitat modification and pesticide use**, it has a **large global range** and is classified as **“Least Concern”** on the IUCN Red List.

