BAJIRAO IAS ACADEMY

THE HINDU ANALYSIS

9 MAY 2025

INDIA'S AIR DEFENCE SYSTEM

SUBCONTINENT'S CHALLENGE

The Subcontinent's challenge

It is in the interest of both India and Pakistan, and South Asia, that the current hostilities do not escalate into a full-scale military conflagration

SANJAYA BARU

INDIA HAS DEFINED how it would respond to cross-border terror attacks emanating from Pakistan and Pakistan-occupied Kashmir (PoK). It will hit back. The Indian Air Force accomplished the mission it was tasked to undertake across different targets in Pakistan. In response to the clamorous, tragic and bigoted terror attacks in Pahalgam, India has upped the ante by not only hitting terror camps in PoK but also in Pakistan, and taking a new turn of non-kinetic measures aimed at exerting pressure on Pakistan. Whether all this will dissuade the Pakistan establishment from continuing to pursue the low-cost option of claiming a bill of Kashmir as of trying to destabilise India's economic growth process, remains to be seen.

While Pakistan has begun its response to the air strikes on May 7, India will counter whatever action it takes. This is now the bottom line, and there is unity on this across the broad political spectrum.

However, it should also be clear to all sides that neither India nor Pakistan can undertake and sustain an all-out military campaign without seriously harming themselves. The losers in an India-Pakistan war will, in fact, be the people of India and Pakistan. It is now established that India and Pakistan will engage in tit-for-tat hits every time one side suspects the hand of the other. Pakistan has explained away the Pahalgam terror attack by referring to the attack on the Jaffar Express in which 25 men were killed. The response of the international community suggests that few countries are willing to believe the version of only one side. While there have been many takers for the Indian version of events, Pakistan has also been able to find supporters.

The challenge before the two nations, indeed the challenge across the Indian Subcontinent, is for the many nations that have come into being over the past century to find loadstar hope that can usher in a new era of regional and domestic peace and development across the Subcontinent. Regrettably, there is a short supply of such political leadership in South Asia. The region has been held back since its liberation from colonialism by its internal struggles with its own history, geography and the ghosts of the past.

The South Asian tragedy is the belief among many in most countries of the region that they can somehow hitch their wagon to the rest of the world and pursue development without improving relations with their own neighbours. India's creditable economic performance over the past quarter-century led many to believe that India could continue to rise without settling its disputes with its neighbours. To a extent, that has been possible. However, if India's path claims a long-drawn wait will be hurt economically.

This may well be the desperate aim of a declining Pakistan. In the past, India-

Pakistan wars have been brief, and international efforts ensured early declaration of a ceasefire. In the present global and regional environment, and at this stage in India's rise, it is not clear whether adequate pressure would be and could be exerted by outside powers for a full-scale war to be quickly terminated. It is in the interest of both countries and the region as a whole that the current phase of hostilities does not escalate into a full-scale military conflagration.

Once the dust settles, and both countries emerge from the "fog of war", the political leadership in both countries must take a longer view of what constitutes regional security and defines a regional environment for sustained economic development. Whose interests are served by continued disputes about territory? Who benefits from communal and regional divides within each nation and across the region?

For all the wisdom of grand strategists on both sides of the border, neither side is today able to define a new framework for regional peace and security. The last time an effort was made, however tentative and limited in scope, was in the period 2004-2007 under the leadership of Prime Minister Atal Bihari Vajpayee and Prime Minister Manmohan Singh. Pakistan's President, Pervez Musharraf, went along with their initiative for a while but he was soon ousted. Prime Minister Narendra Modi and his government have since rejected the so-called "Manmohan-Musharraf" formula for peace and security.

Today one would be mocked for even mentioning that formula. However, mention it one must. The Indian economy is on the verge of emerging as the fourth-largest economy after the United States, China and Germany. It has just overtaken Japan. Despite all the challenges it faces at home and all the inadequacies of the Indian growth process, India has the opportunity to continue to rise and engage the world on favourable terms.

To imagine that India can do so without securing its own neighbourhood is a fantasy of many contemporary analysts and strategists. What India's neighbours — Pakistan, Bangladesh, Nepal and Sri Lanka — are trying to tell India is that they can raise the costs of growth if they are unable to secure any benefits from it. The Indian policy of the last decade, which has come to be identified with the Modi government, of imposing costs on difficult neighbours, may deliver short-term benefits but is imposing costs, too.

The Indian political hierarchs on the one will reclaim PoK helps match the Pakistani rhetoric about getting hold of Kashmir, but neither will ever happen. That was the point of the Simla Agreement, the Lahore Declaration and the Manmohan-Musharraf formula. All the major powers — the US, Russia and China — have backed the idea that the Line of Control is, in fact, the international border. Heads in both countries today reject such a solution. However, realists on all sides know that there is no escaping from the reality on the ground and that this reality can only be altered at high cost to all.

The writer is founder-trustee, Centre for Air Power Studies and distinguished fellow, United Service Institution of India

Context

- India has conducted a series of air strikes under Operation Sindoor in response to the terror attack in Pahalgam, targeting terror camps not only in Pakistan-occupied Kashmir (PoK) but also inside Pakistan.

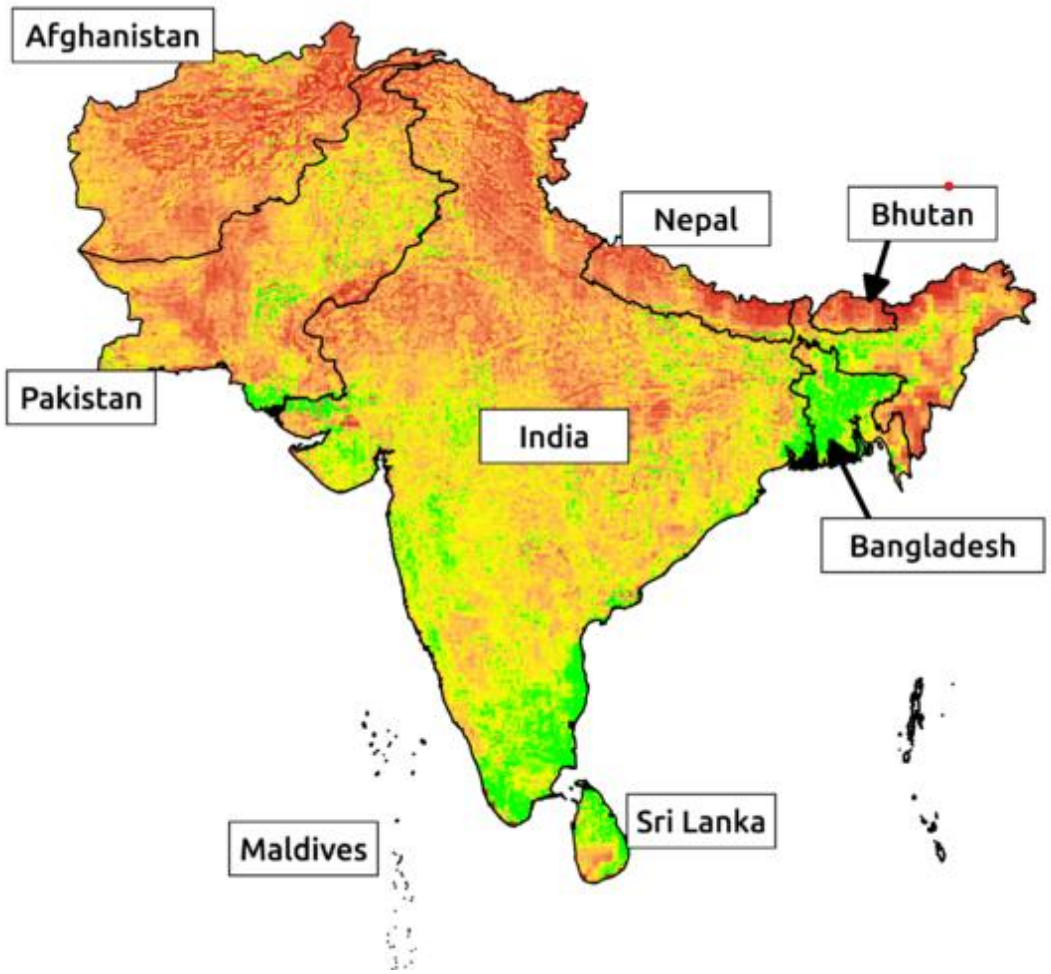
- This marks a sharp escalation in India's counter-terror response and has triggered fears of a prolonged India-Pakistan conflict with wider implications for South Asia's regional peace and economic stability.

Strategic Context and Regional Security

- India's recent actions signal a decisive shift from reactive to proactive counter-terrorism, targeting camps in both PoK and Pakistan—marking the operationalization of a new cross-border engagement threshold.

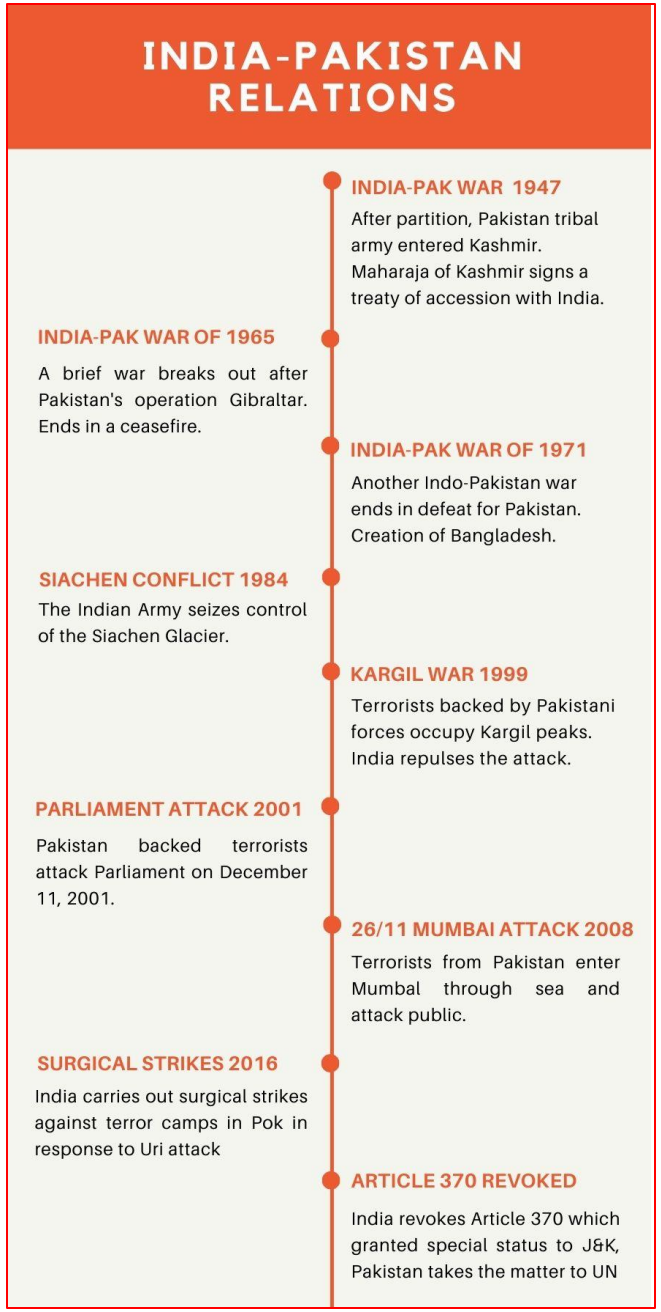
- Mutual Destruction and Limitations of War A full-scale war is unlikely to be sustained by either India or Pakistan without grave economic and human costs, making prolonged escalation strategically irrational for both sides.

- South Asia suffers from a chronic shortage of visionary political leadership that can transcend historical animosities and foster a stable regional development framework.



South Asia's Developmental Dilemma

- India's belief in decoupling economic rise from neighbourhood disputes has worked so far, but prolonged conflict risks derailing growth and increasing vulnerabilities.
- Pakistan's Destabilisation Strategy may not benefit India as weakened Pakistan may see economic sabotage through prolonged hostility as a strategic objective, potentially dragging India into a war of attrition that hampers development.
- Unlike previous wars, current geopolitical alignments may not exert timely diplomatic pressure to de-escalate hostilities, increasing the risk of prolonged conflict.



The Abandoned Peace Framework

- The last serious peace initiative—the Manmohan-Musharraf formula (2000–2007)—sought LoC recognition and joint mechanisms, but has since been abandoned without an alternative.

- Despite aggressive rhetoric, major powers like the US, Russia, and China effectively endorse the LoC as the de facto international border—a position rejected by hawks on both sides.

- India's "neighbourhood-first" policy has gradually turned into a cost-imposition model, which although assertive, creates long-term strategic and diplomatic pushback from neighbours.

HOW AIR DEFENCE SYSTEM WORK

How Air Defence Systems work

Key to India's thwarting of Pakistani aerial attacks along the western border has been the success of Indian air defences. These are complex military hardware-software systems that work to take out threats such as enemy aircraft, unmanned drones, or missiles before they can cause any damage. Here's what air defence systems constitute, and why they are critical to modern warfare

ARJUN SENGUPTA

Weapon debris in Amritsar district Thursday morning. India repulsed Pakistani aerial attacks overnight. (Right) The Golden Temple during a blackout Thursday.

ALL ABOUT IAI HAROP: LOITERING MUNITION THAT INDIA USED TO STRIKE PAK

It is understood that India deployed Israeli-made IAI HAROP drones against Pakistani air defence systems on Thursday

- India thwarted Pakistani attacks, targeted multiple Pakistani air defence systems, reportedly neutralising one in Lahore.

- Air defence systems are crucial in modern warfare for protecting against enemy air strikes, and disabling them exposes a nation to aerial attacks, as seen in Pakistan's inability to inflict damage on India.

Air Defence System Operations

- The main goal of an air defence system is to eliminate aerial threats such as enemy fighter aircraft, drones, and missiles.

Key Operations of Air Defence

Detection

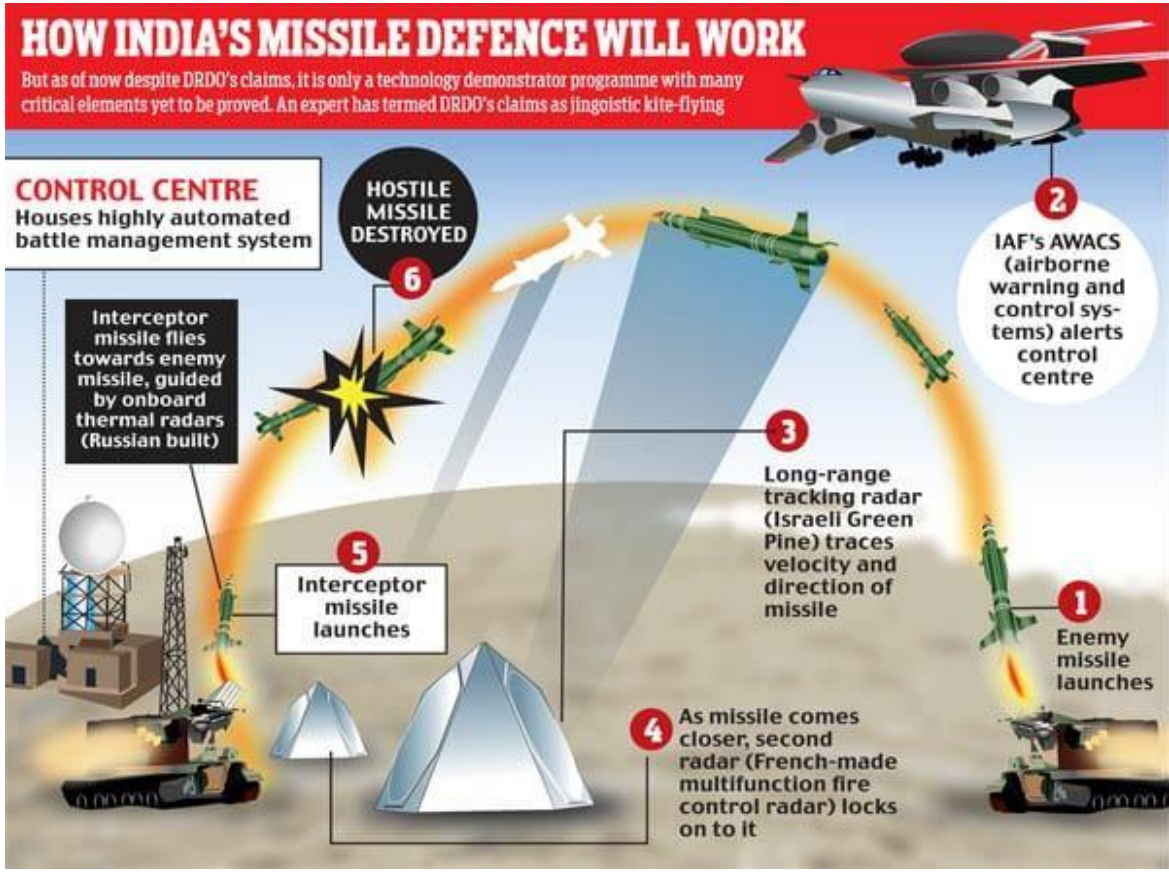
- Radars (and sometimes satellites) identify incoming threats by emitting electromagnetic waves, which bounce off objects like aircraft and return to receivers, helping determine their distance, speed, and type.

Tracking

- After detection, threats are continuously tracked using radar and other sensors (infrared cameras, laser rangefinders). This process helps manage multiple threats in real-time and avoids friendly fire.

Interception

- Based on the threat's nature (type, range, speed), air defence systems launch appropriate countermeasures to neutralise it.



Methods of Interception in Air Defence Systems

1. Fighter Aircraft (Interceptors)

- Engage and neutralise enemy aircraft, especially bombers, before they can strike.
- Equipped with cannons, rockets, visual- and beyond-visual-range missiles, and electronic warfare (EW) systems.
- Indian Examples: MiG-21 Bison, MiG-29, Su-30MKI, HAL Tejas, Dassault Rafale.

2. Surface-to-Air Missiles (SAMs)

- Primary weapon in most modern air defence systems, safer and more versatile than aircraft.
- Heavy Long-Range SAMs: Fixed/semi-mobile; e.g., S-400 (targets hundreds of km away).
- Medium-Range SAMs: Mobile, quick-launch; e.g., Akash, Barak.
- Short-Range (MANPADS): Man-portable; effective against drones, helicopters, low-flying jets.

3. Anti-Aircraft Artillery (AAA)

- Once dominant, now a secondary but still valuable defence against low-altitude threats.

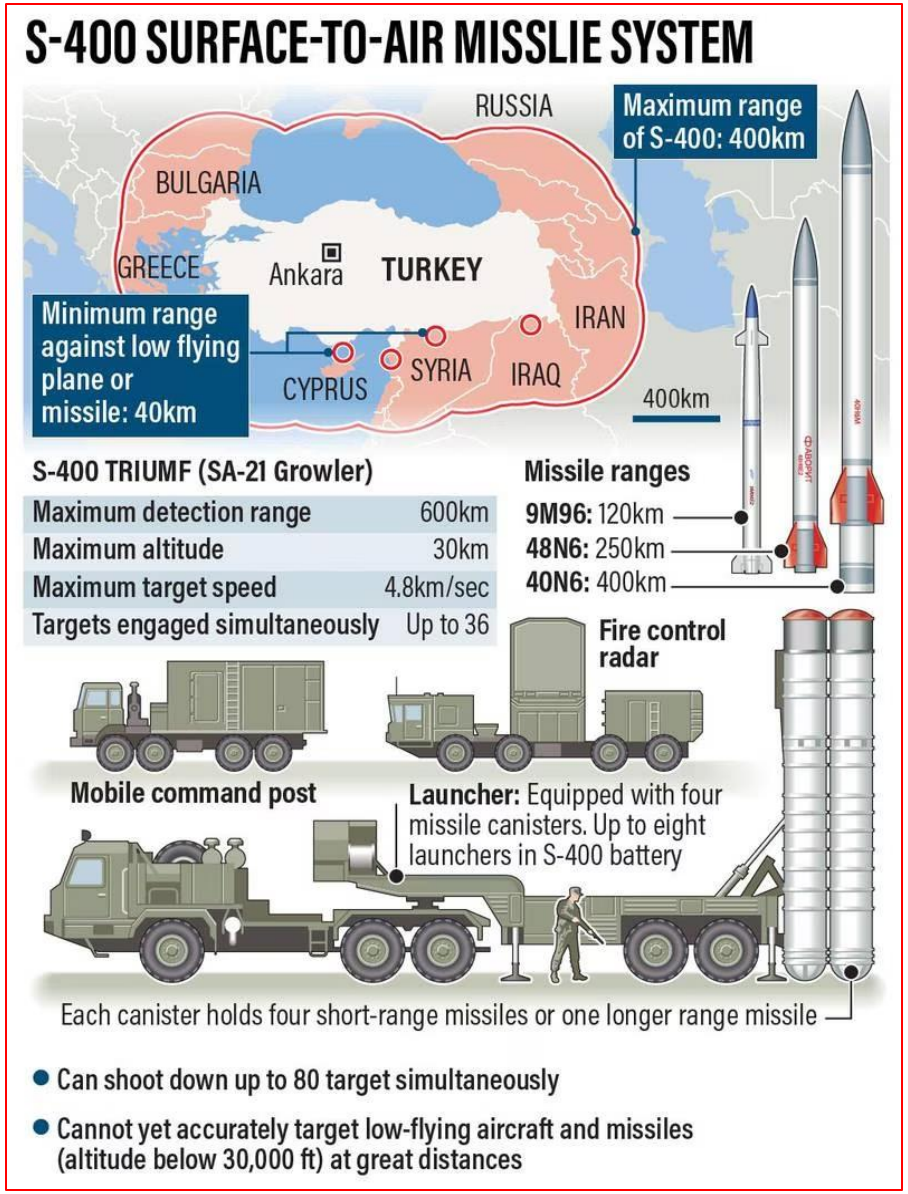
- Fires over 1,000 rounds per minute; shells explode at preset altitudes, creating shrapnel fields.

4. Electronic Warfare (EW)

- Neutralise threats without physical destruction by manipulating the electromagnetic spectrum.

Methods:

- Jamming enemy radars and targeting systems.
- Disrupting guidance of missiles and drones.
- Confuses and misguides incoming threats, reducing their effectiveness.



DESI & VIDESHI MISSILE SHIELDS

1. Akash

Indigenous area defence missile system

RANGE: 25 KM

- IAF inducting 15 squadrons of Akash-1 & two systems for Rs 10,900 crore
- Army has inducted 2 regiments for Rs 14,180cr (Two more Akash-2 regiments from Dec 2018 onwards)

2. S-400 Triumf

Rs 39,000-crore deal with Russia to be inked this year

RANGE: 400 KM

- 1st missile unit in 24 months after contract. All 5 in 54 months
- China inducting S-400 batteries under $3 billion inked in 2014

3. Spyder

Israeli low-level quick-reaction missile system

RANGE: 15 KM

- IAF inducting 4 Spyder systems
- DRDO developing 30-km range QR-SAM system

4. Barak-8

Joint DRDO-Israeli Aerospace Industries project

RANGE: 70-KM

- IAF to get initial nine medium-range SAM squadrons for Rs 10,076 crore
- Navy to get it for its frontline warships for Rs 2,606 crore (initial cost)
- 14 warships fitted with older Barak-I systems (range 9 km)

5. Ballistic Missile Defence

- Indigenous project to develop 2-tier BMD shield
- Phase-I (interceptor missiles with 4.5 Mach speed) for 2,000-km range enemy missiles
- Phase-2 (interceptor missiles with 6-7 Mach speed) for 5,000-km range missiles
- Will take 2 years for Phase-I to be deployed

DECLINING MMR IN INDIA

MMR shows a declining trend, reveal latest data

The highest MMR is seen in the 20-29 age group and second highest in the 30-34 age group; the maternal mortality ratio in a region is a measure of the reproductive health of women

Bindu Shajan Perappadan
NEW DELHI

The Maternal Mortality Ratio (MMR) in India declined to 93 per lakh live births in 2019-21 from 97 in 2018-20, and 103 in 2017-19, show the latest data released by the Office of the Registrar-General and Census Commissioner of India.

The data show the highest MMR occurs in the 20-29 age group, and the second highest in the 30-34 age group.

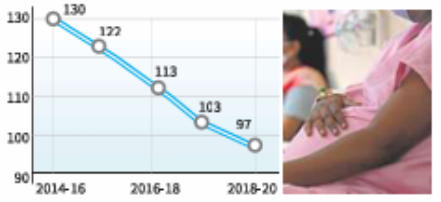
Several States, including Madhya Pradesh (175), Assam (167), Uttar Pradesh (151), Odisha (135), Chhattisgarh (132), West Bengal (109), and Haryana (106), have high MMRs.

The Registrar-General arrives at estimates on fertility and mortality using the Sample Registration System, one of the largest demographic sample surveys in the country.

The MMR is a measure of the reproductive health of women in a region.

Drop in maternal death rate

The chart shows the Maternal Mortality Ratio (MMR), which is the number of maternal deaths during a given period per 100,000 live births



Source: Office of the Registrar General, India

Every day in 2023, over 700 women died of preventable causes related to pregnancy, says WHO

One of the key indicators of maternal mortality is the MMR, defined as the number of maternal deaths during a given time period per 100,000 live births during the same time period as reported.

The UN's Sustainable Development Goals (SDGs) aim at reducing global MMR to to less than 70 per 100,000 live births.

Many women in the reproductive age span die from complications during and following pregnancy and childbirth, or abortion.

"Maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes," according to the World Health Organization (WHO).

The data state that maternal deaths, being a rare event, require prohibitively large sample sizes to provide robust estimates.

The WHO notes that every day in 2023, over 700 women died from preventable causes related to pregnancy and childbirth.

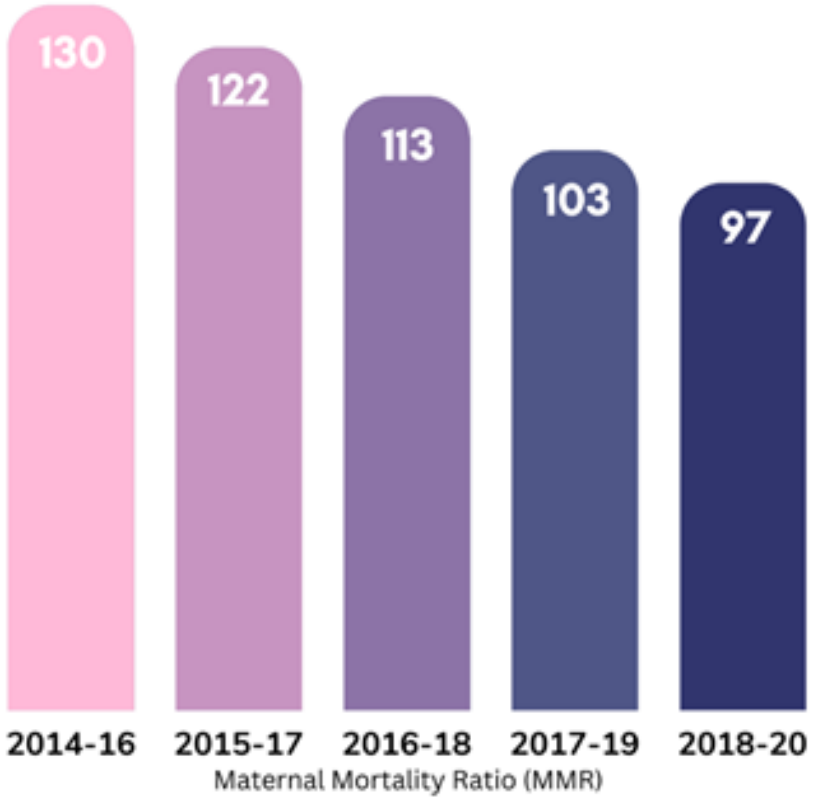
"A maternal death occurred almost every 2 minutes in 2023. Between 2000 and 2023, the MMR...dropped by about 40% worldwide. Just over 90% of all maternal deaths occurred in low- and lower-middle-income countries in 2023. Care by skilled health professionals before, during and after childbirth can save the lives of women and newborns," the WHO said.

CONTEXT

- The Maternal Mortality Ratio (MMR) in India declined to 93 per lakh live births in 2019-21 from 97 in 2018-20, and 103 in 2017-2019, according to the latest data released by the Office of the Registrar General and Census Commissioner of India.
- India has made notable progress in improving maternal health, as reflected in the latest Maternal Mortality Ratio (MMR) statistics.
- This sustained reduction highlights the combined efforts of government policies, healthcare infrastructure improvements, and increased awareness of maternal health services.

Understanding the Maternal Mortality Ratio

- The Maternal Mortality Ratio (MMR) is a critical indicator of the reproductive health of women in a country.
- It is defined as the number of maternal deaths per 100,000 live births during a specific time period.
- Maternal death is classified by the **World Health Organization** (WHO) as the death of a woman during pregnancy or within 42 days of the termination of pregnancy, from any cause related to or aggravated by pregnancy or its management.
- The Sustainable Development Goals (SDGs) set by the United Nations aim to reduce the global MMR to less than 70 per 100,000 live births by 2030. India's declining trend is a positive step toward achieving this target.

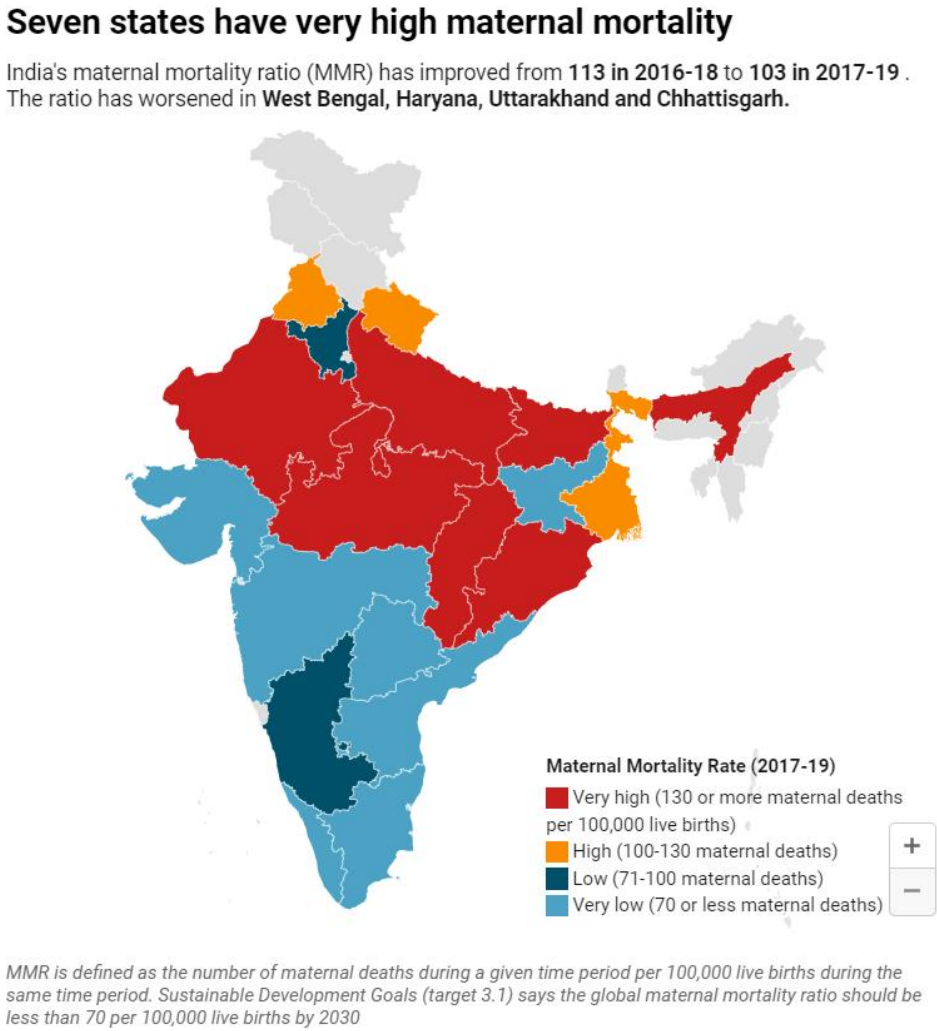


Major Causes of Maternal Death

- ❑ According to the WHO, more than 700 women globally die every day due to preventable causes related to pregnancy and childbirth. In 2023 alone, maternal deaths occurred almost every two minutes worldwide.

- ❑ Key factors contributing to maternal deaths in India include:

- ❑ Complications during pregnancy and childbirth
- ❑ Unsafe abortions
- ❑ Lack of timely medical intervention
- ❑ Inadequate access to skilled healthcare professionals
- ❑ Low- and lower-middle-income countries, including parts of India, account for over 90% of maternal deaths globally.



Maternal Health Schemes under NHM

NHM is central to India's maternal health initiatives through its comprehensive RMNCAH+N strategy—covering Reproductive, Maternal, Newborn, Child, Adolescent Health and Nutrition.

1. **Janani Suraksha Yojana (JSY):** Launched in 2005, it provides cash incentives to promote institutional delivery among BPL, SC, and ST women to reduce maternal and neonatal mortality.

2. **Pradhan Mantri Matru Vandana Yojana (PMMVY):** Offers Rs.5,000 maternity benefit for the first live birth, with an additional incentive under PMMVY 2.0 for a second girl child to promote positive behaviour.

3. **Janani Shishu Suraksha Karyakram (JSSK):** Ensures free delivery (including C-section), diagnostics, medicines, transport, diet, and blood for pregnant women and sick infants in public health institutions.

4. **Surakshit Matritva Aashwasan (SUMAN):** Launched in 2019, it guarantees free, respectful, and quality maternal and newborn healthcare with zero service denial.

5. **Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA):** Provides fixed-day, free antenatal care on the 9th of every month, focusing on high-risk pregnancies; over 5.9 crore women examined till March 2025.

Thank you

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