DAILY CURRENT AFFAIRS

1st August 2025

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Mains Manthan

- Boost the capacity of legal aid system (Page No – 09)
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Prelims Saarthi

- India launches NISAR satellite

1. Transforming early childhood care and education

Why in News?

- Early Childhood Care & Education

Syllabus

- **GS Paper 2** – Governance & Social Justice

Transforming early childhood care and education

Jatin Goyal

is Director (Education), Union Territory of Dadra Nagar Haveli and Daman and Diu, and Joint Secretary (Finance). He was Director (Women and Child Development) earlier

Understanding the key structural shifts driven by National Education Policy 2020 and preparing for them are essential

The National Education Policy 2020 (NEP) has ushered in transformative changes in the educational landscape of India, particularly in the field of Early Childhood Care and Education (ECCE). While private schools have had nursery classes for long, government schools have historically admitted children only from Class one, thus sowing the seeds of inequity even before the start of schooling. By paving the way for the opening of preschool classes for 3-6 year olds in government schools – previously catered to only by Anganwadis in the public sector – the NEP has initiated a long-overdue structural transformation towards equity.

There are three key structural shifts in the ECCE sector, driven by the NEP, with each one unfolding at a different pace. Understanding these shifts and preparing for them is crucial in ensuring quality early childhood care and education for the nation's children.

An expansion

First, the expansion of the ECCE sector. A significant but often underappreciated shift is the anticipated growth of the ECCE sector by 2030, the target year for its universalisation. For decades, the public sector's ECCE infrastructure had stagnated at approximately 14 lakh Anganwadi centres. This is now set to expand significantly. With the NEP paving the way for three preschool classes (Balvatika-1,2,3) in government schools, the number of public ECCE classes will increase significantly. This will have substantial implications for personnel management, including the financing, recruitment, training and deployment of skilled ECCE providers.

The Ministry of Education has already begun allocating budgets under the Samagra Shiksha scheme for the ECCE. Many States and Union Territories (UTs) have begun utilising this provision to introduce preschool classes in government schools. But, some have not begun to use this provision, while others have under-utilised it with some training or material being added, without starting additional classes. The extent and manner of this utilisation needs to be tracked.

Migration from anganwadis

The second shift is the growing emphasis on education when compared to other ECCE services such as health and nutrition. This trend is already visible in the Union Territory of Dadra and Nagar Haveli and Daman and Diu, where the Union Territory has introduced a preschool class in all its primary schools, prioritising the admission of 4-6 year olds. This has resulted in a substantial migration of this age group from Anganwadis to schools.

Data shows that parents have overwhelmingly preferred preschool classes in schools over Anganwadis, when given both options. This migration is largely driven by the perception that schools offer better educational opportunities. As a result, the traditional image of Anganwadis as vibrant centres filled with toddlers is now at risk as more government schools open preschool classes, and children in the 3-6 year age group move out of Anganwadis to schools.

The Anganwadi system must adapt by emphasising education as a part of its ECCE services. The Ministry of Women and Child Development's 'Poshan bhi Padhai bhi' initiative is a timely step. However, its success depends on tangible implementation at the ground level, targeting an increase in measurable indicators such as the time spent by an Anganwadi worker on educational activities.

While schools cater to this demand, they need to be aware of the risks of excessive 'schoolification' of pre-schooling. They need to retain play at the centre of this education, in order to focus on the breadth of skills, instead of focusing on the narrower skills of reading and writing in the pre-school classes.

The critical role of home visits

Third, the potentially most transformative shift is the possible reorientation of the Anganwadi system to focus on children aged 0-3 years through home visits, rather than focusing on 3-6 year olds attending the centres. Research, such as the 'Perry Preschool at 50' study in the United States and the Yale university study in Odisha done in collaboration with Pratham, highlights the critical role of home visits in early childhood development programmes.

In India, policymakers such as V. K. Paul (Member, NITI Aayog) and N.C. Saxena (IAS, retired) have long advocated focusing on 0-3-year olds within the Integrated Child Development Services (ICDS) framework, given the disproportionate developmental benefits during this stage. While the Prime Minister's Overarching Scheme For Holistic Nourishment (POSHAN) Abhiyan has emphasised the importance of the first 1,000 days of life, implementation challenges persist. Overburdened Anganwadi workers naturally focus on 3-6 year olds who are physically present at the centres, leaving limited scope for individualised services to 0-3 year olds through home visits.

If government schools assume responsibility over 3-6 year-olds, we have a unique opportunity where the Anganwadi system could redirect its focus towards 0-3 year olds, along with the care of pregnant and lactating mothers, through more intensive home visits.

This shift, if realised, would mark a truly transformative change in India's ECCE framework. The seeds for this transition have already been sown in the NEP 2020.

The views expressed are personal

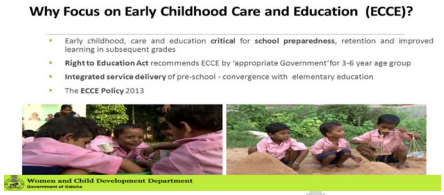
Key Takeaways from the Article

- **Expansion of ECCE Sector:**
  - **ECCE sector expansion** is a key shift dueto NEP 2020, aiming to universalize ECCE by 2030.
  - **Government schools** are now offering preschool classes for 3-6-year-olds, expanding beyond traditional Anganwadis.
  - **Samagra Shiksha Scheme:** Government funding for ECCE through this scheme has been allocated, but some states have underutilized it or have not started the classes yet.

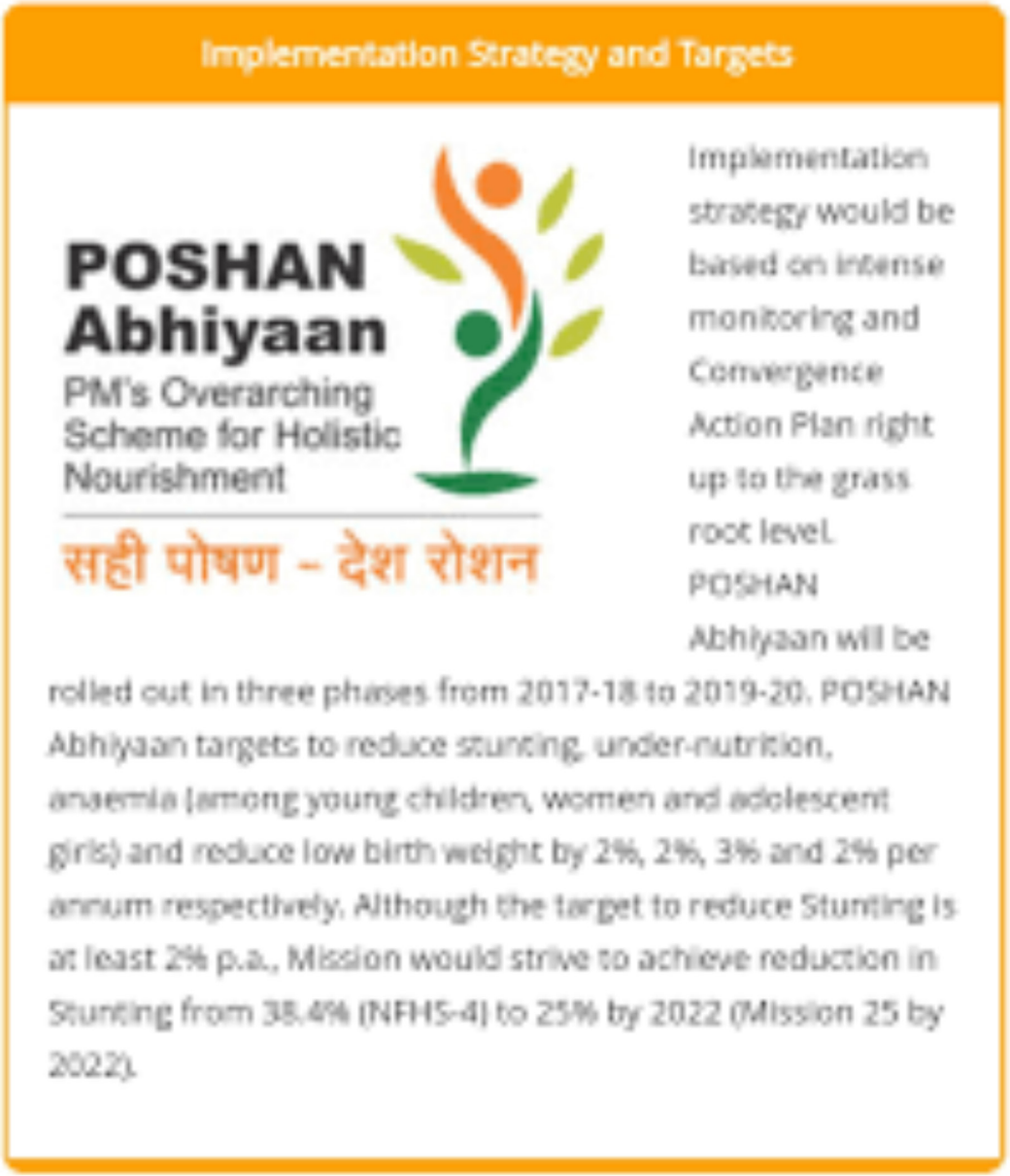
पढे चलो . बढे चलो
Samagra Shiksha, Delhi

- **Migration from Anganwadis to Schools:**
  - **Migration of children** from **Anganwadis** to schools is evident, as **parents prefer school-based preschool classes** due to perceived educational benefits.
  - **Anganwadis' role** must adapt, with a focus on education alongside health and nutrition, as seen in the **'Poshan bhi Padhai bhi' initiative.**
  - Schools should avoid excessive "schoolification" of preschooling and retain **play-based learning** to foster a broader skill set.

- **Focus on 0-3-Year-Olds via Home Visits:**
  - A **shift towards focusing on children aged 0-3** years through **home visits** is crucial for early childhood development.
  - **Studies (Perry Preschool and Yale's Odisha study)** highlight the importance of home visits for the developmental stage of children aged 0-3 years.



  - The **ICDS framework** and initiatives like **POSHAN Abhiyan** are already promoting the significance of the first 1,000 days.
  - Anganwadis could **redirect focus** towards 0-3-year-olds, with **home visits** for personalized care, while government schools take responsibility for 3-6-year-olds.



2. Malaria's new frontlines – vaccines, innovation & Indian endgame

Why in News?

- Malaria problem in India

Syllabus

- **GS Paper 2** – Governance & Social Justice

Malaria's new frontlines:
vaccines, innovation, and the Indian endgame

India's malaria story is no longer one of uniform burden — it's a fight against hidden reservoirs, remote geographies, and a parasite that won't quit. Elimination by 2030 is not just a goal — it's a test of whether science, policy, and public health can unite to defeat an ancient foe

Anirban Mukhopadhyay

In 2023, malaria infected nearly 294 million people and killed close to 6,00,000. Despite early victories in the fight against malaria, global progress has stalled in recent years. The parasites are adapting, becoming resistant to treatments, while mosquitoes are surviving insecticides.

India has reduced its malaria burden by over 80% between 2015 and 2023 — but last year, tribal districts such as Lawngtlai (Mizoram) and Narayanpur (Chhattisgarh) still recorded malaria rates of over 56 and 22 cases per 1,000 people, respectively as per the National Centre for Vector Borne Diseases Control — reminders that the parasite continues to thrive in several pockets long after national averages have improved.

While Africa faces mostly *Plasmodium falciparum*, India also battles the relapse-prone *Plasmodium vivax* which can lie dormant in the liver and reawaken weeks or, even months later. In Jharkhand, mixed infections account for nearly 20% of cases (NCVBDC), complicating elimination. Even where incidence has dropped, the parasite can persist — lurking in asymptomatic carriers (people with no symptoms) or returning months after infection.

The search for smarter, longer-lasting vaccines has never been more urgent.

After decades of setbacks, the first approved malaria vaccine — RTS,S — arrived in 2021. It offered about 55% protection in the first year, but efficacy waned by 18 months, requiring a fourth booster dose.

The R21/Matrix-M vaccine, developed by Oxford and the Serum Institute, showed up to 77% efficacy in Phase 3 trials winning World Health Organization (WHO) approval in 2023. Fewer doses, low cost, and Indian production make it especially promising.

Still, both vaccines target only one stage of the parasite, leaving reinfection and transmission a lingering threat.

Instead of targeting a single protein, like in RTS,S and R21, whole-parasite vaccines expose the immune system to the entire malaria parasite — alive, but weakened. The experimental PfSPZ vaccine mimics natural infection using radiation-weakened *P. falciparum* sporozoite (the parasite's early-stage form) delivered directly into the bloodstream. Early studies showed that 96% of participants developed strong antibodies, with up to 79% protection after the third dose.

Building on that foundation, a modified version called PfSPZ-LARC2, developed by Sanaria, may push efficacy even further. The simplicity of a one-dose regimen, despite the intravenous requirement, could make it a strong candidate for targeted use in outbreak zones or among hard-to-reach migrant populations in India.

Unlike vaccines that target the parasite's earlier stage, PfRH5 acts during the blood stage, when symptoms appear and the risk of severe illness increases. Since RH5 is a vital protein for red blood cell invasion that the parasite can't easily alter, it offers cross-strain protection — a rare asset in malaria vaccine design. Phase 1a/b and Phase 2b trials in the U.K., The Gambia, and Burkina Faso have shown promising outcomes. These vaccines could complement earlier-stage ones and may help boost natural immunity in people who've previously had malaria.

Transmission-blocking vaccines

While the above vaccines aim at protecting individuals, transmission-blocking vaccines (TBVs) target the parasite in the mosquito — halting its spread at the population level. Pfs230D1 induces antibodies that prevent parasite fertilisation within the mosquito gut. In Mali, it reduced transmission by 78% in a Phase 2 trial.

This strategy is especially relevant to India with a far higher proportion of asymptomatic carriers. "Our group and others in India are actively working on TBVs to address this reservoir," said Agam P. Singh, scientist at the National Institute of Immunology, New Delhi.

Slow progress: Commuters moving through smoke during an anti-malaria fumigation drive. Despite early victories in the fight against malaria, global progress has stalled in recent years. R.V. MOORTHY

India, too, is entering the TBV space with its own candidates. In July 2025, AdFalciVax was announced by the Indian Council of Medical Research (ICMR), the country's first indigenous dual-stage malaria vaccine. Unlike single-phase vaccines, it combines pre-erythrocytic (PfCSP) and transmission-blocking (Pfs230 and Pfs48/45) antigens to both prevent infection and block mosquito transmission. "AdFalciVax has completed preclinical testing," said Subhash Singh, who leads the programme at ICMR-RMRC, Bhubaneswar.

In mice, it triggered strong immune responses lasting over four months — roughly equivalent to a decade in humans — and remained stable at room temperature for nine months, potentially aiding rural deployment.

Progress is also visible beyond *P. falciparum*. A first-in-human trial in Thailand showed that *P. vivax* TRV Pvs230D1M reduced mosquito transmission by up to 96%, another ray of light for India's mixed-species numbers. India, too, is not far behind. "A similar research programme for *P. vivax* is underway, in collaboration with AdFalciVax co-inventors Sanghamitra Pati and Sushil Singh," said Dr. Singh.

Boosting immune power

Strengthening the immune response itself is another active front. A recent protein-based vaccine combined a ferritin nanoparticle with CpG — a type of adjuvant, or immune booster already used in hepatitis B vaccines — and cut liver-stage parasite burden by 95% in mice.

AdFalciVax showed over 90% protection in mice even with alum, a mild and widely used adjuvant. "We saw protection on a par with more inflammatory adjuvants such as MPLA (a stronger adjuvant)," said Dr. Singh. "Whether this holds in humans remains to be seen."

Scientists are also testing newer vaccine platforms such as mRNA, which allow vaccines to be made faster and tweaked more easily than protein-based ones. In 2025, researchers at CureVac and the U.S. National Institute of Health (NIH) encoded the Pfs25 antigen — targeting the parasite's sexual stage — into an mRNA-lipid nanoparticle. They observed complete transmission blockage in mice, with antibodies lasting over six months from just two doses.

> Challenges that need to be addressed include producing GMP-grade components, developing immune biomarkers, and benchmarking efficacy against RTS,S and R21
>
> SUBHASH SINGH
> Programme head ICMR-RMRC

However, not all mRNA-based vaccine efforts are moving ahead smoothly. In early 2025, BioNTech's Phase 1/1a trial for its blood-stage mRNA vaccine candidate BNT165c was placed on clinical hold by the U.S. Food and Drug Administration (FDA). While the company did not disclose the reason, it noted that discussions with regulators are ongoing. The pause highlights the hurdles of translating mRNA platforms into malaria vaccines.

"mRNA and nanoparticle platforms can certainly be explored — alone or in combination," said Pawan Malhotra, emeritus scientist at the International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi. "But it's hard to predict what will work. Plasmodium is complex, unlike bacteria or viruses."

Beyond boosting the strength of the immune response, scientists are also exploring how to improve its aim — modifying malaria antigens to help the body recognise the parasite more efficiently. A new experimental vaccine links PfCSP — a surface protein from the malaria parasite — to MIP3α, a molecule that acts like a flare to draw in immune cells. In mice, it triggered stronger antibody and T cell responses than standard mRNA vaccines, reducing liver-stage infection by up to 88%. It hasn't yet been tested in humans, but it shows how tweaking the immune response could push malaria vaccines past current limits.

Beyond vaccines, researchers are exploring how malaria hides from our immune system. *P. falciparum* uses RIFIN proteins to bind to immune 'off switches' like the LILRB1 receptor, shutting down immune cells.

It is a tactic that helps the parasite hide in plain sight.

A new study describes an experimental, engineered antibody, DiD2.v-IgG, designed to block this interaction. Built from a segment of the LILRB1 receptor, the antibody binds to RIFIN 110 times more strongly than the natural version — outcompeting the parasite at its own game. By blocking this interference, it freed the body's LILRB1 to function normally, restoring immune attack in lab tests. Though still untested in animals, the approach could one day support new malaria therapies or enhance vaccine responses.

While engineered antibodies attack the parasite, CRISPR-based gene drives go after its vector. These tools insert fertility-disrupting genes into mosquitoes. In a landmark study, this approach wiped out entire *Anopheles gambiae* colonies within a year — with no resistance detected.

But evolution rarely plays along. In the wild, mosquitoes might adapt, ecosystems could shift, and once released, gene drives can't be recalled. The idea of eradicating a species raises thorny ethical and ecological questions.

So, researchers are exploring subtler strategies. One 2025 study edited a single letter in the FREP1 gene, blocking the malaria parasite from developing inside the mosquito. With a gene drive, this parasite-blocking trait spread to over 90% of lab mosquitoes in ten generations — without harming their fertility or survival. But the parasite remains under pressure to evolve around the block, and infected mosquitoes still live long enough to potentially transmit malaria if the trait doesn't saturate the population.

Another team took a different route — engineering mosquitoes to die sooner only when infected. By disabling an immune gene, they created a self-limiting feedback loop: the more malaria spreads, the more it kills its own carriers.

Challenges and the path ahead

India aims at eliminating malaria by 2030. It's an ambitious plan — but one that hinges on precision and persistence.

"*P. cynomolgi* — a monkey malaria species — is the best model for *P. vivax* research," said Dr. Malhotra. "We were developing it 20 years ago with the Central Drug Research Institute (CDRI), but strict monkey access laws and lack of scientific foresight stalled it."

Despite these challenges in *vivax* research, efforts to develop a vaccine are gaining ground. Both Dr. Subhash Singh at ICMR and Dr. Agam P. Singh at NII confirm that *P. vivax* vaccine candidates are under active development.

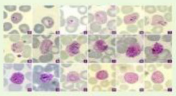
But even the most innovative science needs systems to carry it forward.

"We need a COVID-style push," said Dr. Malhotra. The science is advancing — but it needs infrastructure and political will to match. Dr. Singh echoes the sentiment. "We are now concentrating on translating AdFalciVax's promising preclinical results into trials. Successful deployment however, will require good results over multiple stages of trials as well as regulatory approvals, likely taking at least 7-8 years." In addition, strong coordination between regulators, industry, and researchers is needed. The ICMR has already floated an Expression of Interest seeking industrial partners to co-develop the vaccine. "Challenges that need to be addressed include producing GMP-grade components, developing immune biomarkers, and benchmarking efficacy against RTS,S and R21," added Dr. Singh.

"We definitely need vaccines, antibodies, new drugs — for both *P. falciparum* and *P. vivax*," said Dr. Malhotra. "But that's not enough. Doctors need training, resistance must be tracked, and vector control has to keep pace." It must be a full-spectrum battle — from the molecular level to the community clinic.

India's malaria story is no longer one of uniform burden — it's a fight against hidden reservoirs, remote geographies, and a parasite that won't quit. With next-gen vaccines, homegrown innovation, and growing scientific momentum, the country stands at a critical juncture. Elimination by 2030 is not just a goal — it's a test of whether science, policy, and public health can unite to defeat an ancient foe.

(Anirban Mukhopadhyay is a geneticist by training and science communicator from Delhi. anirban.genetics@south.du.ac.in)



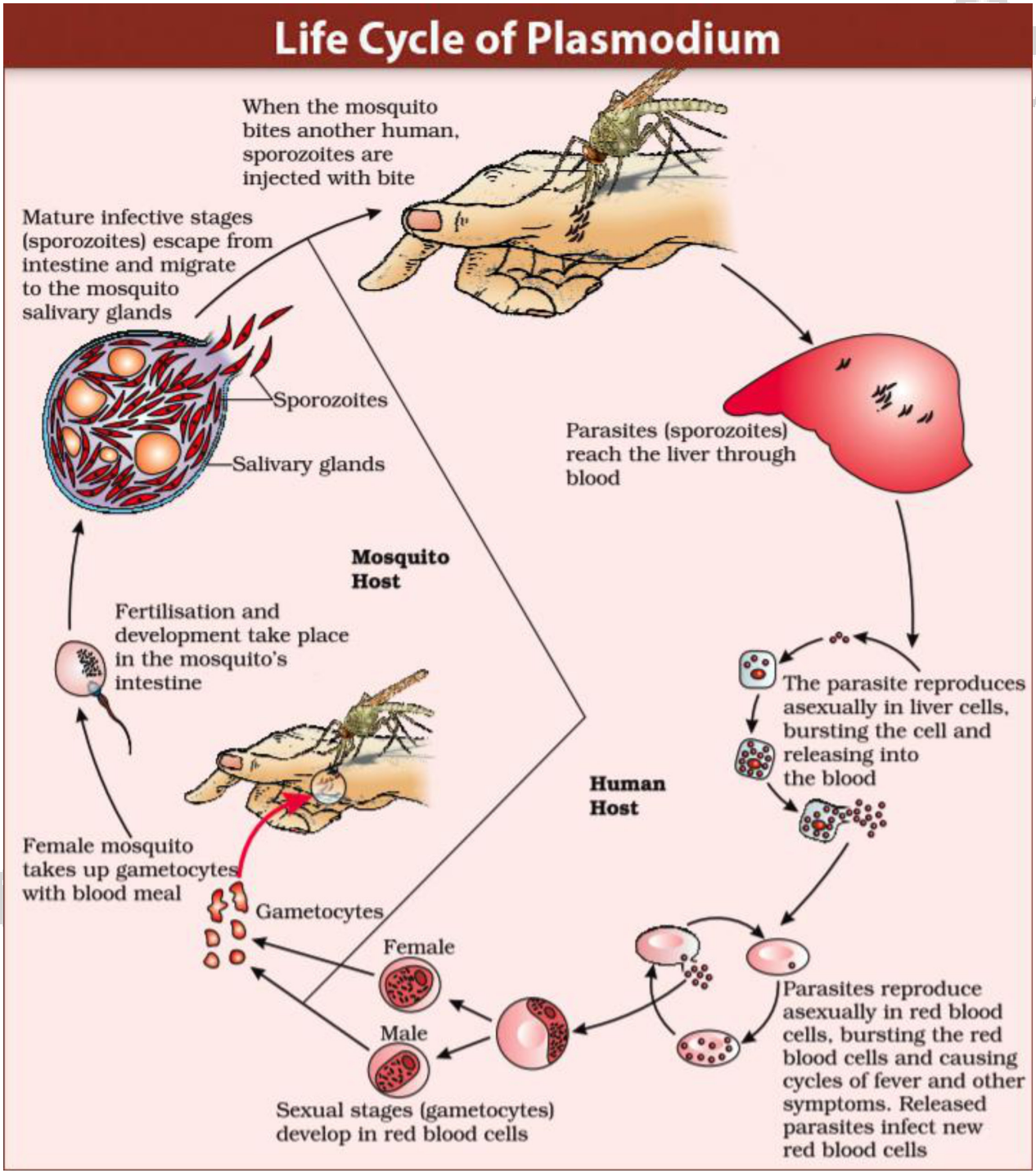
Photomicrographs of *Plasmodium vivax* in Giemsa-stained thin blood films. WIKIMEDIA COMMONS

THE GIST

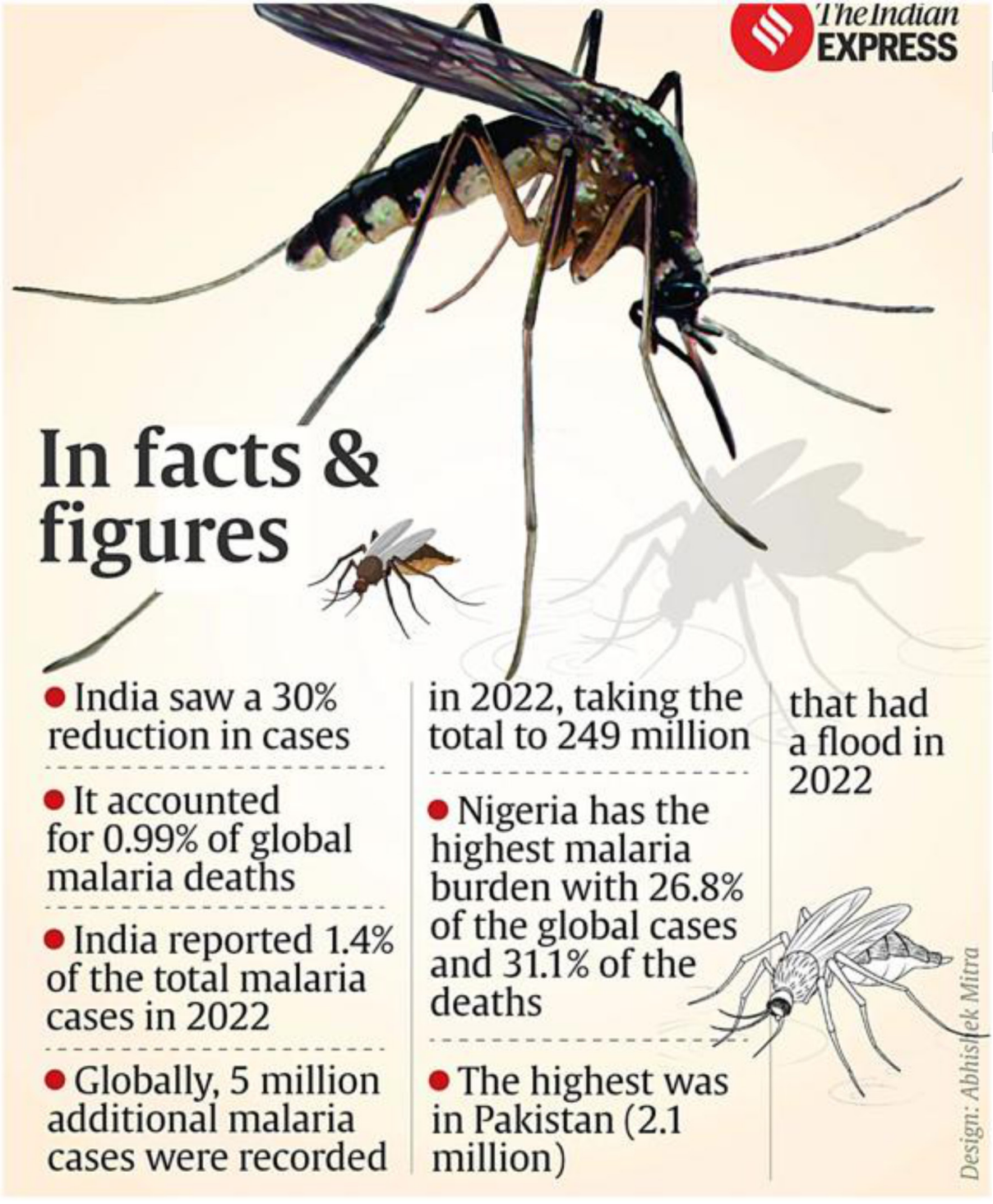
- India has reduced its malaria burden by over 80% between 2015 and 2023 — but last year, tribal districts such as Lawngtlai (Mizoram) and Narayanpur (Chhattisgarh) still recorded malaria rates of over 56 and 22 cases per 1,000 people, respectively as per the National Centre for Vector Borne Diseases Control — reminders that the parasite continues to thrive in several pockets long after national averages have improved
- The search for smarter, longer-lasting vaccines has never been more urgent. India aims at eliminating malaria by 2030. It's an ambitious plan — but one that hinges on precision and persistence. Even in places where infections seem to be minimal, adults and older children often act as asymptomatic reservoirs, quietly sustaining transmission
- We definitely need vaccines, antibodies, new drugs, say experts. But that's not enough. Doctors need training, resistance must be tracked, and vector control has to keep pace, they add. It must be a full-spectrum battle — from the molecular level to the community clinic

Key Takeaways from the Article

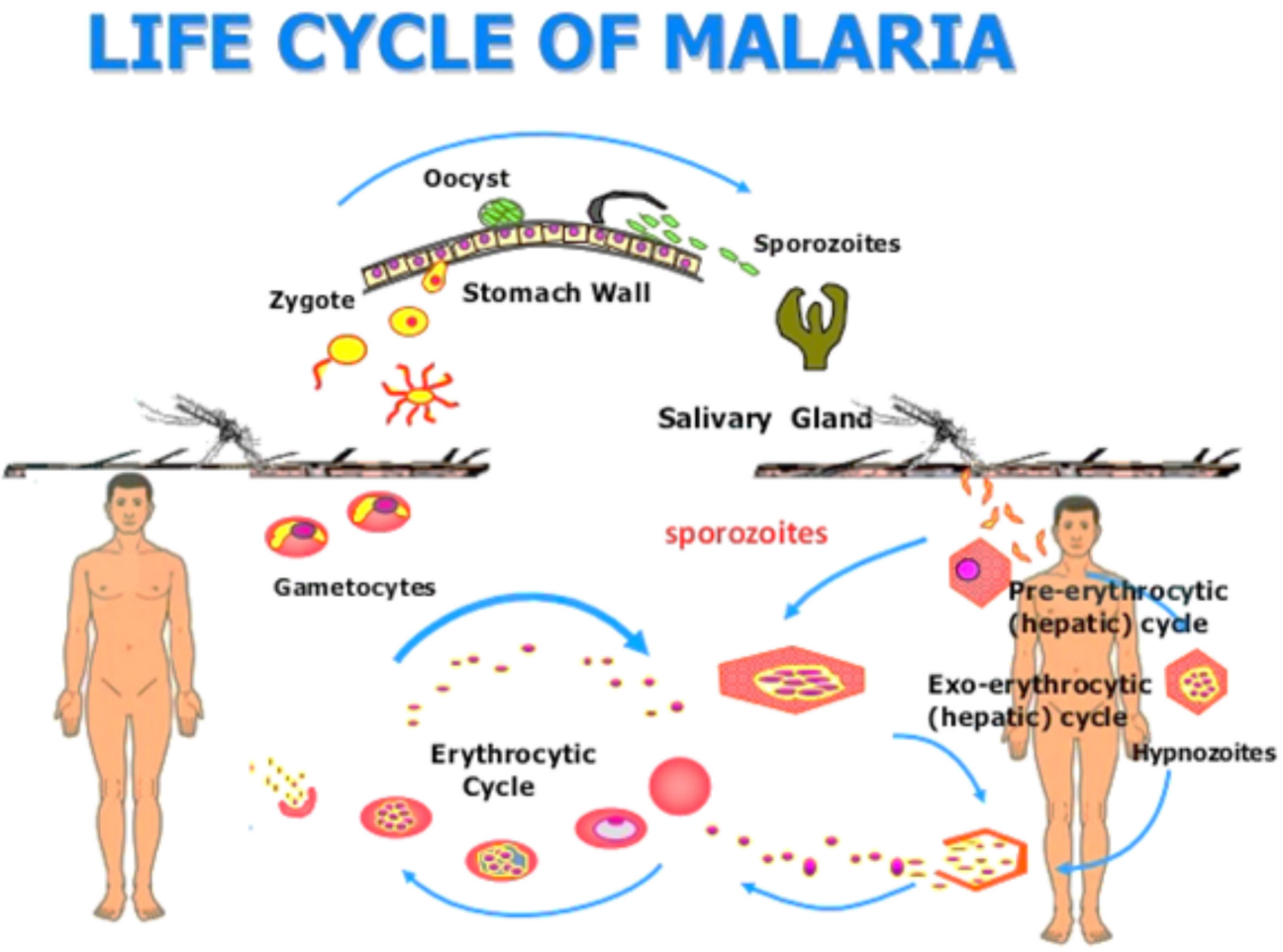
- **Malaria Burden in India and Globally:**
  - In **2023**, malaria affected **294 million people**, resulting in **600,000 deaths.**
  - India reduced its malaria burden by **over 80%** between 2015-2023, but **tribal districts** still reported high malaria rates, particularly in **Lawngtlai** (Mizoram) and **Narayanpur** (Chhattisgarh).



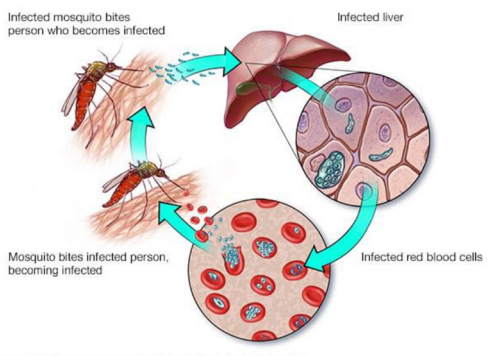
- **Plasmodium Vivax vs. Plasmodium Falciparum:**
  - India deals with **Plasmodium vivax,** which can remain dormant and relapse, alongside the more common **Plasmodium falciparum** in Africa.
  - **Mixed infections** in places like Jharkhand complicate malaria control efforts.



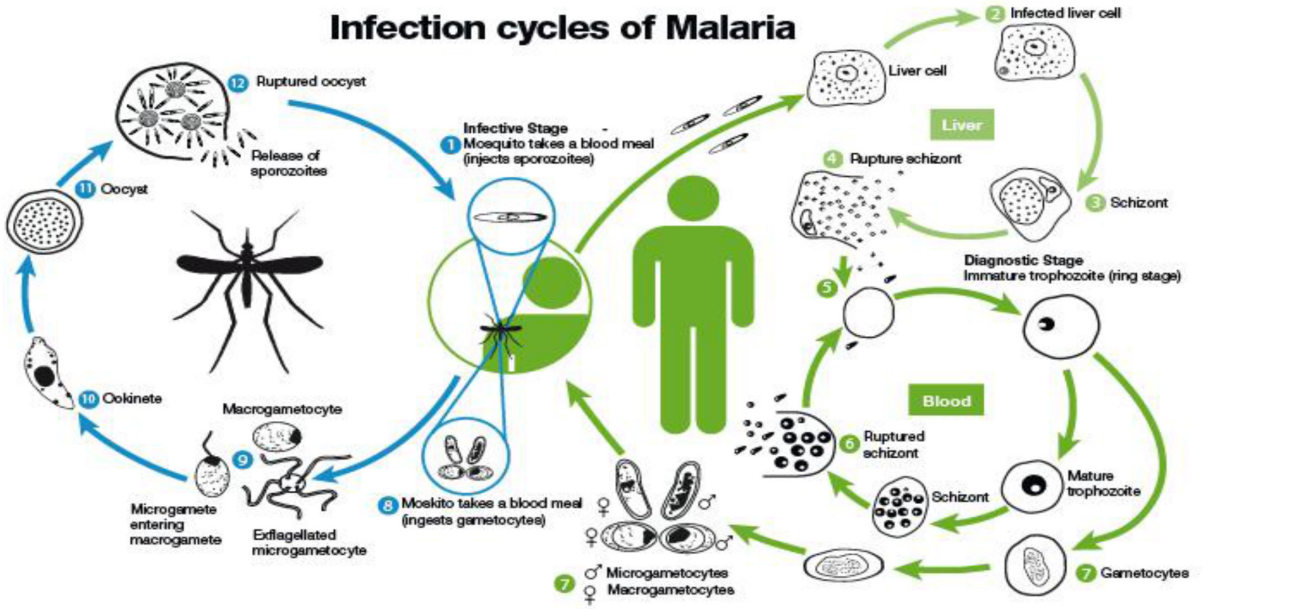
- **Current Malaria Vaccines:**
  - The first approved vaccine, **RTS,S**, provides 55% protection in the first year but requires a fourth booster dose.
  - **R21/Matrix-M,** developed by **Oxford** and the **Serum Institute,** offers **77% efficacy,** with **fewer doses** and lower cost, especially suitable for **India's needs.**



- **New Frontiers in Vaccine Development:**
  - **PfSPZ vaccine:** A whole-parasite vaccine that mimics **natural infection** using weakened sporozoites. Early studies show up to **79% protection** after the third dose.
  - **PfRH5 vaccine:** Targets the **blood stage** of the parasite, offering **cross-strain protection** with promising results from trials in the **U.K., The Gambia, and Burkina Faso.**

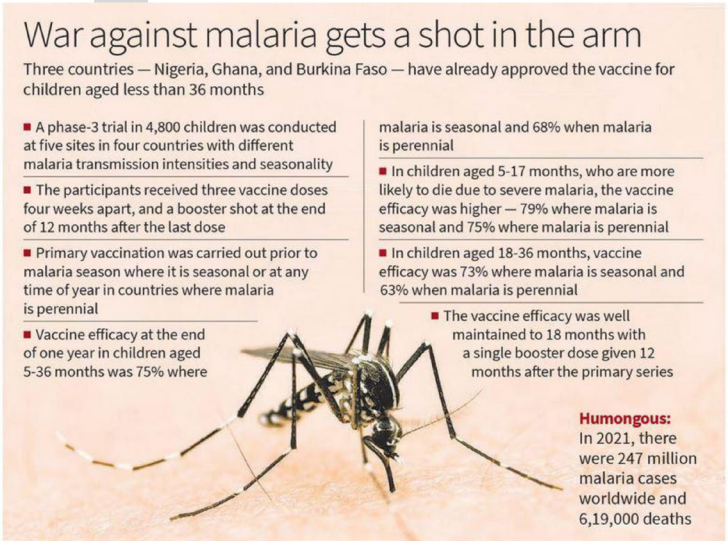


- **Transmission-Blocking Vaccines (TBVs):**
  - **TBVs** aim to block transmission of **malaria** in mosquitoes. Trials for **Pfs230D1** showed a **78% reduction** in transmission in **Mali.**
  - India is developing its own TBVs, with **AdFalciVax** being India's **first indigenous dual-stage malaria vaccine**. It has shown strong immune responses in preclinical testing.

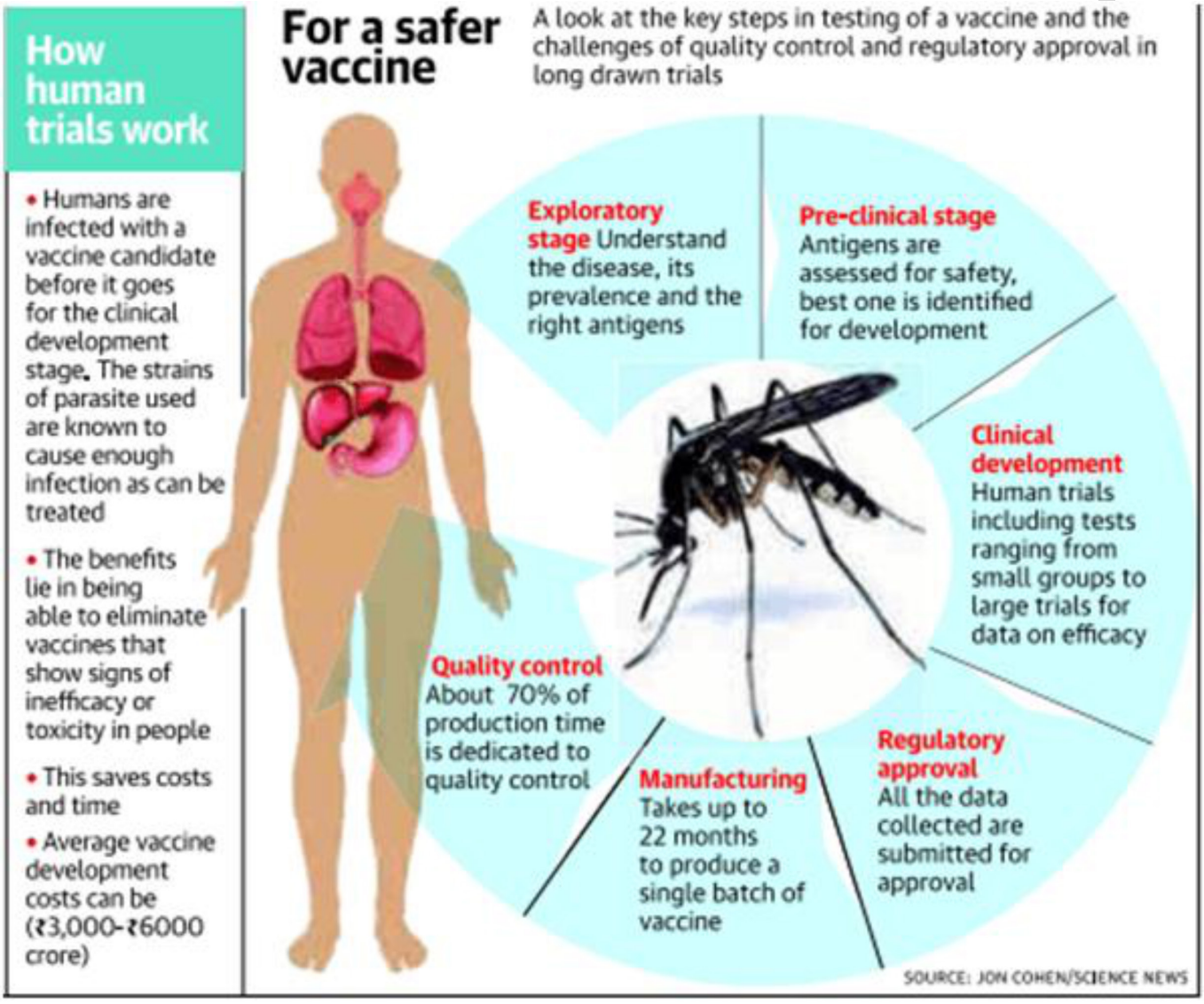


Source: www.dpd-cdc-gov/dpdx

- **Advancements in Malaria Immunity and Gene-Editing:**
  - **Immunity Boosting:** New protein-based vaccines have demonstrated up to **95% reduction** in liver-stage infections in mice.
  - **Gene Editing: CRISPR**-based gene drives are being explored to genetically modify mosquitoes to block the parasite's development, though challenges persist.



- **Challenges in Eliminating Malaria by 2030:**
  - India aims to **eliminate malaria by 2030,** facing challenges like hidden reservoirs, **remote geographies,** and **resistant parasites.**
  - There is a need for **vaccines, drugs, training for doctors, resistance tracking**, and **effective vector control** to achieve this goal.



- **HOPE Mission:**
  - **Protoplanet,** a Bengaluru-based company, launched the **HOPE** project in **Tso Kar**, Ladakh, aimed at simulating **space conditions.**
  - The mission involves a **10-day isolation experiment** with selected **crews** who will live in a research station to study **human adaptability** in deep space conditions.

'Station' in Ladakh begins research to simulate life on Mars

Jacob Koshy
NEW DELHI

To prepare for possible manned missions to the moon and potentially Mars, Protoplanet, a Bengaluru-based company involved in space science popularisation, launched human outer planet exploration (HOPE) in Tso Kar, Ladakh, the company said.

HOPE is intended to be a research station where selected "crew" – beginning Friday – will take turns inhabiting the station as part of a 10-day "isolation mission". "They will undergo extensive physiological and psychological studies to assess human adaptability and resilience in conditions simulating deep space environments," Protoplanet said.

The high-altitude and cold desert-like conditions here serve as an "exceptional analogue site, closely mimicking the geological and environmental conditions found on the moon and Mars", it noted.

"ISRO funded a portion of the station's development as well as advised on the criteria for selecting candidates," Siddharth Pandey, director, Protoplanet, told *The Hindu*.

- **Collaboration with ISRO:**
  - The **Indian Space Research Organisation (ISRO)** funded a portion of the project and provided **guidance** on selecting candidates for the mission.
- **Focus Areas:**
  - The **mission will focus on physiological** and **psychological studies** of the crew, assessing their **resilience** and **adaptability** to extreme conditions over extended periods.
- **Future Applications:**
  - The insights gained from this experiment will be critical for **future manned space missions,** specifically to the **Moon and Mars.**