GS Paper II – Polity

Exclusion from electoral rolls doesn't repeal voting rights forever, says Supreme Court

Krishnadas Rajagopal
NEW DELHI

The rights of West Bengal voters purged from the electoral rolls during the special intensive revision (SIR), and unable to make it to any of the supplementary lists ahead of the Assembly election, cannot be "washed away forever", the Supreme Court said on Wednesday.

A three-judge Bench headed by Chief Justice of India (CJI) Surya Kant made the observation in the context of 19 tribunals constituted by the Election Commission of India (EC) to hear appeals of persons excluded from the electoral roll.

Justice Joymalya Bagchi, on the Bench, said the adjudication and appellate processes of the SIR exercise must be taken to its logical conclusion, and anything less would lead to an "extremely oppressive" situation.

> The SIR exercise must be taken to its logical conclusion, and anything less would lead to an extremely oppressive situation
>
> **JUSTICE JOYMALYA BAGCHI**
> Supreme Court judge

The Bench also highlighted a Calcutta High Court communication saying nearly 47 lakh of a total 60 lakh claims under adjudication had already been disposed of and the remaining would be cleared by April 7.

The appellate hearings would ensure justice for those excluded incorrectly, CJI Kant said.

The Bench directed that the poll body should provide the tribunals complete access to the reasons and remarks recorded by adjudicating officers on why "logical discrepancy was justified and deletion of a person from the electoral roll was warranted".

The appellate tribunals, notified by the EC on March 20, are presided over by former Chief Justices and judges of High Courts. Chief Justice Kant said the appellate hearings before seasoned judges in the tribunals would ensure that justice would be done to those excluded incorrectly.

The final date for filing nominations for the first phase of elections, which will see 152 of the total 294 Assembly constituencies go to poll, was April 6.

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MANY OUT OF ROLLS
» PAGE 11

GS Paper II – International Relations

Orderly exit

While cutting down on oil, India must avoid new forms of dependence

Global energy shocks are not new. The world has seen them before – in the early 1970s after the Yom Kippur War; in 1979 following the Iranian Revolution; in 1990-91 after Iraq's invasion of Kuwait, and in 2022 after Russia's invasion of Ukraine. Yet, the present crisis triggered by American-Israeli strikes on Iran is materially different. While Russia's war with Ukraine sharpened the geopolitical use of natural gas, the current conflict has simultaneously disrupted oil and gas flows. This disruption comes at a moment of profound transition in the global energy system. The International Energy Agency has underlined that transport electrification is firmly underway, with electric vehicles displacing about 0.9 million barrels per day (mb/d) of oil demand in 2023, rising over 30% to about 1.3 mb/d in 2024. This still amounts to barely 1%-1.3% of global oil demand, but it signals a structural shift. A supply shock of roughly 8 mb/d could accelerate the transition away from fossil fuels.

The energy transition could also unsettle the dollar's long-standing dominance in global energy trade. The "petrodollar" system, forged in the aftermath of the 1970s oil shocks through U.S.-Gulf strategic alignment, ensured that oil was priced in dollars and that surplus revenues were recycled into U.S. financial markets. This underpinned both the financialisation of oil and America's capacity to sustain large fiscal deficits. The emerging paradigm is more fragmented, with energy shifting from a globally traded commodity to geographically dispersed supply chains centred on critical minerals. Lithium reserves are concentrated in Chile (30%), Argentina (13%) and Australia (20%+). The Democratic Republic of Congo accounts for over 70% of global cobalt production, while Indonesia dominates the nickel market. Copper, crucial for electrification, is likewise concentrated in Chile and Peru. Canada is emerging as a key supplier of nickel, cobalt, and lithium, while Australia leads lithium production for western supply chains. Yet, the decisive advantage lies in processing and manufacturing, where China is dominant. This raises the possibility that a future energy system could be as dependent on Chinese industrial capacity – and potentially the yuan – as the old system was on dollar-denominated oil. For countries such as India, this presents a dilemma. The transition offers an opportunity to reduce fossil fuel dependence, but also risks creating new technological and supply chain dependencies. Navigating this landscape will require a conscious strategy rooted in the Global South's legacy of non-alignment – securing resources, building domestic technological capabilities in manufacturing and processing, and avoiding a new form of dependence that merely shifts old hierarchies.

GS Paper II – Polity

How anti-corruption bodies are politicised

Yashovardhan Azad

Retired IPS officer who has served as the Central Information Commissioner, Secretary Security GOI and Special Director Intelligence Bureau

It began with great fanfare. Investigative agencies announced a massive corruption conspiracy case in Delhi's excise policy, alleging kickbacks of ₹100 crore and a deep nexus between business interests and politicians. The case, which was investigated by the Central Bureau of Investigation, with parallel proceedings by the Enforcement Directorate, led to the arrest of political figures, including then Delhi Chief Minister Arvind Kejriwal and Deputy CM Manish Sisodia and businesspersons. Months of custody, prolonged interrogation, and repeated court hearings followed. The case dominated television debates for months, shaping electoral narratives and public perception.

Now, years later, the case ended with a judicial order from the trial court declining even to frame charges. The court concluded that the prosecution had failed to produce material establishing a *prima facie* case of criminal conspiracy or bribery. It also noted the absence of clear evidence linking policy decisions to illegal personal gain.

What began as one of the most sensational corruption prosecutions in recent memory has ended, and left us with an uncomfortable question – how did a case launched with such certainty fail to cross even the basic threshold required for trial?

Lingering questions

The most immediate question is institutional. Should an investigating agency initiate a prosecution of this magnitude without a reasonably solid evidentiary foundation?

The decision to register a First Information Report (FIR) is legally the beginning of a criminal process. But in politically sensitive cases, it also carries immense consequences – arrests, reputational damage, and long periods of incarceration before trial. When a case collapses at the threshold stage, it inevitably invites speculation that the investigation itself may have been driven by extraneous pressures.

The head of an investigative agency, therefore, needs to ensure that prosecutions are grounded in evidence rather than suspicion or political momentum.

The judicial threshold

The collapse of such high-profile cases is not unique to India. Corruption is among the most difficult crimes to prove anywhere in the world. This is because unlike violent crimes, corruption rarely leaves visible evidence. Money moves through intermediaries, shell companies, consultancy contracts, or political donations. The benefit may not even appear as cash – it may appear as favourable regulatory decisions or advantageous contracts. Hence, successful corruption prosecutions usually depend on a complex evidentiary architecture: financial trails, documentary records, digital communications, and corroborated witness testimonies.

If any link in this chain is missing, courts hesitate to infer criminal intent. The Supreme Court has repeatedly held that policy decisions taken by governments cannot automatically be criminalised unless there is clear evidence of dishonest intent and personal gain. This is exactly what was inferred by the court in the Delhi excise policy case. And while these principles protect individuals from politically motivated prosecutions, they also make corruption cases difficult to sustain.

However, the real difficulty may lie less in judicial standards and more in investigative capacity. Many corruption prosecutions in India still rely heavily on witness statements rather than on forensic financial analysis. Modern corruption investigations require sophisticated tools: forensic accounting, data analytics, tracing beneficial ownership of companies, and reconstruction of financial flows across jurisdictions. Agencies in countries such as Singapore and Hong Kong have developed specialised expertise in these areas.

In contrast, India's investigative ecosystem remains fragmented across multiple agencies with uneven coordination.

The political dilemma

The Kejriwal case illustrates a deeper structural dilemma in Indian democracy. On the one hand, corruption in public life remains a widely acknowledged problem. Allegations surround major public contracts from liquor policies to irrigation projects. Public confidence requires that such allegations be investigated seriously. On the other hand, criminal law must not become a weapon in political hands. If arrests and prosecutions are perceived as tools of the political executive, the legitimacy of anti-corruption institutions suffers irreparable damage.

While India's anti-corruption agencies have secured many convictions in trap cases where officials were caught accepting bribes, large policy-level corruption cases have rarely ended in successful prosecutions. When allegations of corruption surround large public contracts but rarely lead to convictions, public cynicism deepens. What India needs are credible examples of rigorous investigation and successful prosecution in huge bribery cases. Such cases would demonstrate that corruption can be punished without compromising legal fairness.

The excise policy case should therefore not be seen merely as a political victory or loss. It should prompt a broader institutional reflection. Investigative agencies must strengthen their capacity for financial forensics and evidence gathering. Prosecutors must ensure that cases brought before courts are built on robust evidentiary foundations. And political leaders must resist the temptation to deploy criminal law as a tool of partisan contest.

The head of an investigative agency needs to ensure that prosecutions are grounded in evidence rather than suspicion or political momentum

GS Paper II – Social Issue

An increase in colleges, students but not enough teachers

India's higher educational system must shift its focus from institutional expansion to ensuring equity and quality education

DATA POINT

Anand Kumar
M. K. Shravan
Rosa Abraham

While India's higher education sector has expanded rapidly in recent decades, with many new institutions and more students enrolled than ever before, has this expansion truly translated into equitable access alongside adequate capacity for delivering quality education? The State of Working India 2026 report tries to answer this.

India's higher education sector has seen massive expansion in the last few decades, at least in terms of the setting up of colleges and universities. From about 1,600 colleges and universities in 1950, most of which were publicly funded, the number had grown to over 69,000 by 2022. Most of this expansion has been recent, and driven largely by private providers. College density has also increased nationally, from 29 colleges per lakh youth in 2010 to 45 in 2021. But large regional disparities remain. For instance, many districts in northern and eastern States have fewer than 18 colleges per lakh youth population.

However, college expansion has not been matched by a commensurate expansion in teaching capacity. Regulatory norms recommend between 15 and 25 students per teacher. Even at its best, the average college had about 24 students per teacher in 2010. The situation worsened to 35.4 in 2016 and stood at 32 in 2021. Many northern districts consistently report particularly high student-teacher ratios, despite substantial institutional expansion in these regions **(Map 1)**. Faculty numbers have not kept pace with either the growth in institutions or the rise in enrolment. This is especially concerning since these regions account for a large share of India's youth population.

The Gross Enrolment Ratio (GER), which is the share of population aged 18-23 enrolled in higher education, has increased from 16% in 2011 to 28% as of 2022. India's GER in higher education is now broadly in line with countries at similar levels of per capita income. Importantly, enrolment rates for men and women have almost converged. Participation among disadvantaged social groups has also improved significantly over the past decade **(Chart 2)**. Between 2011 and 2022, enrolment rates among Scheduled Castes increased from 11% to 26%, while for Scheduled Tribes they rose from 8% to 21%.

However, graduates in India are still disproportionately drawn from the richest households. While the share of graduates from poorer households has increased between 2007-2017, it is still a long way away from equitable access.

Cost barrier

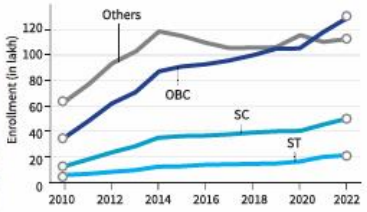
What students study reveals another layer of inequality. As household incomes rise, the likelihood of entering engineering and other professional courses increases. Conversely, students from low-income households are more likely to pursue courses in humanities and commerce streams **(Chart 3)**. Professional degree courses are significantly more expensive, and thus inaccessible for poorer, financially constrained households. A medicine degree costs ₹97,400 while an engineering degree costs ₹72,600 annually as of 2017-18. For poorer households, the annual fees for professional degrees often exceed their average per capita consumption expenditure.

Thus, expanding institutions alone is not sufficient. Bridging regional gaps, investing in faculty capacity, and addressing the cost barriers associated with professional education is critical to make higher education more inclusive. The focus must shift from expansion to equity, ensuring that higher education can translate into improved economic opportunities.

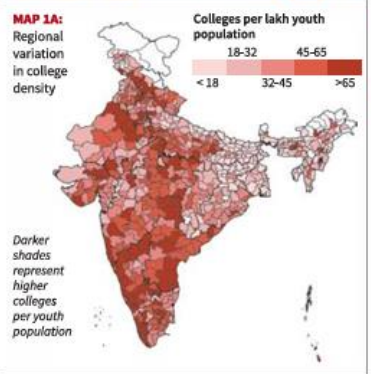
Course of privilege

AISHE and the NSS Social Expenditure on Education Surveys show that higher-income students prefer engineering/professional courses, while lower-income students choose humanities and commerce

CHART 2: Gross enrolments across different social groups. Others include the General category and other groups not classified elsewhere



MAP 1A: Regional variation in college density



MAP 1B: Regional variations in student - teacher ratio

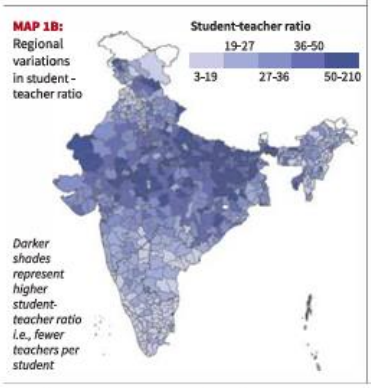
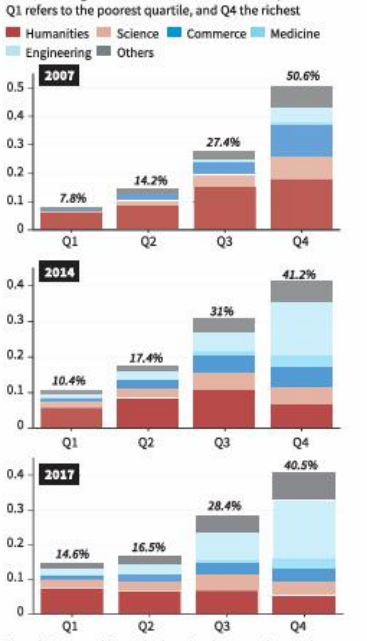


CHART 3: The proportion of households in respective monthly per capita expenditure quartiles which have a student enrolled in a graduate course, across different specialisations. Q1 refers to the poorest quartile, and Q4 the richest



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GS Paper II – Polity

Centre puts off FCRA Bill as protests erupt in Lok Sabha

Amendment Bill is not aimed at any religion but at curbing misuse of foreign contributions, says Kiren Rijiju, counters narrative that it could target minority institutions that receive foreign funds

The Hindu Bureau
NEW DELHI

Amid strong protests from Opposition benches, Parliamentary Affairs Minister Kiren Rijiju on Wednesday informed the Lok Sabha that the government did not intend to bring a Bill to amend the Foreign Contribution (Regulation) Act (FCRA) in the ongoing Budget Session.

Mr. Rijiju accused the Opposition of misleading people in Kerala and across the country ahead of the Assembly election in the State. "I had told the Congress yesterday [Tuesday] that since the Bill has been introduced, it has been listed for consideration and passage for Wednesday. But today [Wednesday], the FCRA (amendment) Bill is not being taken up for discussion," he said.

Protests erupted in the House as soon as the Question Hour began at 11 a.m., with Opposition members, mainly from Kerala, raising slogans against the provisions of the FCRA (Amendment) Bill.

On the defensive: Parliamentary Affairs Minister Kiren Rijiju speaks in the Rajya Sabha in New Delhi on Wednesday. SANSAD TV

Mr. Rijiju said the Bill, introduced last month, seeks to protect national security and interest and asserted that it is not aimed at any religion or organisation. It is intended to prevent misuse of foreign contributions, he said.

"Since there are elections in Kerala, the Congress and the Communists are spreading wrong things about the Bill," he said.

As Opposition members trooped into the Well of the House, Speaker Om Birla adjourned the proceedings till 12 noon. Even before the House met, Opposition members protested outside the main entrance of Parliament.

It is not only the Opposition protests but also pressure from the Kerala unit of the BJP that seems to have forced the government to rethink pushing the FCRA (Amendment) Bill in the Budget session.

Key proposal

One of the key proposals of the Bill is to establish a "Designated Authority" to manage and dispose of foreign funds and assets of NGOs whose registration is suspended, cancelled, or not renewed. In poll-bound Kerala, a narrative has emerged that these provisions can be misused to crack down on minority institutions such as churches, which may receive foreign funds.

Such a concern could not have come up at a worse time for the BJP as the party, after it won one out of the 20 seats in Kerala in the 2024 Lok Sabha polls, has been reaching out to the Christian community in the State to build a dedicated vote base.

Senior CPI(M) leader and Rajya Sabha member John Brittas accused the Union government of blocking attempts to seek elementary information on the government's policy decisions regarding FCRA, saying routine parliamentary questions on the issue are now treated as "secret in nature".

In a detailed post on X, Mr. Brittas said that since 2024 he has submitted eight questions seeking clarity on FCRA suspensions, cancellations, non-renewals, fresh registrations, and the removal of public access to NGO-wise data from the FCRA dashboard. "Yet, none of those questions elicited any response," he wrote.

GS Paper III – Science & Technology

Why is India pushing piped gas now?

Can PNG replace LPG for cooking? Why has LPG been preferred so far? How is LNG transported and used? What is holding back PNG expansion? Can domestic production meet demand? Will PNG reduce LPG import dependence?

EXPLAINER

M. Kalyanaraman

The story so far:

India has a total of 33 crore LPG connections. Recently, Arpan Kumar Mishra, Secretary at the Petroleum and Natural Gas Regulatory Board, said that domestic natural gas production alone could cater to 30 crore connections if all were to switch to piped natural gas (PNG).

What is the difference between LPG, LNG, PNG, and CNG?

LPG is a co-product of oil refining and natural gas processing. That is, its production depends on the processing of both crude oil and natural gas.

Liquefied Natural Gas (LNG), as the name suggests, is natural gas that has been cooled to below -160 degrees Celsius to turn it into a liquid for shipping. Liquefaction reduces its volume by 1,000 times.

Compressed Natural Gas (CNG) is primarily used as a vehicular fuel. It involves compressing natural gas to a pressure of 200-250 kg/cm² (g) to reduce its volume and enable efficient distribution.

How are LPG and natural gas transported to the user?

Propane and butane gases are mixed, pressurised, and cooled to below 40 degrees Celsius, and then transported from the source to consuming countries via ships. LPG is bottled in cylinders and physically delivered to customers.

Piped natural gas is transported through pipelines. Before this, imported natural gas is liquefied and transported through LNG carriers. "LNG carriers use special cargo tanks and insulation systems designed for ultra-low temperatures," stated Mitsui O.S.K. Lines to *The Hindu*. "Put simply, the basic task is to move a very cold liquid onto the ship while preventing it from warming up too much."

At the destination, LNG is regasified and transported to the final consumer through pipes.

Last-mile delivery of LPG is easier through cylinders that are transported through trucks and tricycles than building an extensive pipeline network covering every household for natural gas. This has been a key reason why India adopted LPG for domestic cooking.

Why the push for piped gas against LPG now?

India's dependence on LPG imports is currently higher. For instance, in natural gas, India's one-year import was about 27 million tonnes of LNG last year, and production was roughly the same, according to government data. On the other hand, India – until recently – imported three-fifths of its LPG requirements, of which 90% was routed through the Strait of Hormuz, which has now been blocked due to the war in West Asia. Typical annual LPG consumption is 34 million tonnes, out of which 12 million tonnes are produced in India.

If gas is to be imported, LNG has many more sources across the world. In LPG, India was largely reliant on Saudi Arabia and Qatar and the supplies had to pass through the Strait to reach India. "Globally large capacities of liquefaction plants for natural gas are coming online over the next few years, so availability should be healthy," said Prashant Vasisht, Senior Vice President of ICRA.

A domestic LPG cylinder supplier carries cylinders for delivery in Bengaluru on March 30. | Photo Credit: R. Ravindran

Can natural gas replace LPG straight?

Natural gas is much lighter than LPG. But one kilogram of natural gas can deliver more energy than one kilogram of LPG. For cooking purposes, these differences are not significant, making PNG a drop-in replacement for LPG.

However, in industrial uses, the equipment may need to be tuned to a different setting or even altered. For instance, LPG is widely used by MSMEs for welding and cutting. Reports from the ground indicate that while the government is encouraging industrial users to switch, a lack of awareness and technical know-how may hamper adoption.

How is the government pushing for natural gas?

On March 26, *The Hindu* learnt from senior government officials that over the next two weeks, India could add another 15 lakh new PNG connections.

The official said that instituting last-mile connectivity amidst unfavourable city infrastructure in certain areas was among the major hurdles in expanding the piped gas network.

To speed it up, in a gazette notification, the Centre instituted provisions to help accelerate the uptake, which, among other things, included specific timelines for approving pipeline expansion in housing and non-housing areas.

The Ministry of Petroleum and Natural Gas (MoPNG) told the Parliamentary Standing Committee, which is assessing its demand for grants for FY 2026-27, that it is targeting to have in place a pipeline network that would cover 12 crore PNG connections by 2034.

The committee, in an earlier report, had asked the Ministry to help City Gas Distribution (CGD) entities to overcome difficulties in pursuing expansion, such as in obtaining permissions, land, bidding criteria, and NOC requirements from local authorities.

Across towns and cities, such as in Maharashtra or Coimbatore in Tamil Nadu, where the GAIL pipeline runs close, the government is now pushing for piping infrastructure for local distribution.

As of December, the government announced that India's gas pipeline network spans about 25,000 kilometres, with an additional 30,500 kilometres under construction. The government is also ensuring that PNG pricing remains competitive with LPG.

"PNG connections have now crossed 1.5 crore. A recent government gazette notification reinforces this direction, mandating that households cannot hold both LPG and PNG connections. As a result, roughly 6 million households will be required to surrender their LPG connection and transition fully to PNG within a three-month timeframe. This will bring total household PNG connections to 2 crore soon," said Manish Sejwal, Senior Vice President at Rystad Energy. "Since the 2020-21, the compounded annual growth rate in connections has been some 18%. A CAGR of 24% would be needed to reach 12 crore connections by 2034-35," he added.

What are the challenges?

The GAIL pipeline network is currently concentrated in western and northern India, with some coverage in Kerala and Bengaluru. The 30,000-kilometre-plus pipelines under construction cover tier-2 and tier-3 cities in parts of central and eastern India, as well as some parts of Tamil Nadu connecting to the Bengaluru leg, and one section going to the northeast. However, large regions in central, southern, and northeastern India remain uncovered. Further, the alignment of the gas pipeline network is more intended to serve industrial needs than households.

The government has aggressively given CGD licences that would cover more than 300 geographical areas covering households, small industries, hotels and restaurants. As of now, some 90 of them are still not connected to the main trunk pipeline. Last-mile connectivity remains an immediate challenge.

Even if projections of 12 crore PNG connections are met in another 10 years, LPG connections will still be more than 20 crore, leaving India requiring to import significant amounts of LPG.

A little less than 30% of natural gas use goes into making fertilisers, while power plants account for 15% and city gas distribution around 20%, said ICRA's Mr. Vasisht. Some 35% goes to sectors like refineries and industries.

A major diversion from these sectors such as power may be needed to cater to cooking gas demand. Mr. Vasisht said industrial consumers can switch to naphtha and furnace oil.

PNGRB secretary Mr. Mishra had said that as of now some 1.2 crore PNG connections consume three million metric standard cubic metres of gas every day.

To supply 15 crore connections, India will have to increase domestic production by at least one-third.

Industry observers say that an increase in domestic production from Oil and Natural Gas Corporation (ONGC) fields is possible. Rystad Energy projects a 25% increase.

For instance, ONGC commenced production in the KG-DWN 98/2 Block in the KG basin in 2024. Peak production of the field is expected to be over 10 million metric standard cubic metres per day of gas, which would mean increasing today's overall gas production in India by 10%. Site officials expect the 98/2 block to increase ONGC gas output by 15% through more wells. Increasing imports through LNG may well be required if natural gas consumption is ramped up. India has some nine import terminals covering both coasts.

It will have to truly ramp up the pipeline network to leverage the imports. Further, India's LNG system is even more of a just-in-time system than LPG, with little long-term storage, unlike in Europe. Any disruption in imports will have an immediate impact on availability.

(With inputs from Saptaparno Ghosh and Appala Naidu)

THE GIST

- India has 33 crore LPG connections, but domestic natural gas production could cater to 30 crore connections if households switch to piped natural gas (PNG).
- LPG is delivered in cylinders, while natural gas is transported through pipelines or as LNG and regasified, with PNG emerging as a drop-in replacement for cooking.
- The government is pushing PNG to reduce high LPG import dependence, but pipeline expansion, last-mile connectivity, and supply constraints remain key challenges.

GS Paper III – Science & Technology

GETTY IMAGES

Qdenga: a step forward against dengue, but not a silver bullet

India's first dengue vaccine offers hope at reducing severe disease even as evolving viral patterns warrant cautious optimism; the vaccine is best understood as one that modifies the disease rather than blocks transmission, meaning outbreaks will not disappear

Vipin M. Vashishtha

India's long wait for a dengue vaccine may finally be coming to an end. Takeda's tetravalent dengue vaccine, TAK-003 (called 'Qdenga'), recently received clearance from the Subject Expert Committee (SEC) under the Drugs Controller General of India (DCGI) for use among individuals aged 4 to 60 years. This marks a significant milestone in the country's fight against a disease that causes millions of infections and thousands of hospitalisations every year, especially among children.

While India has not experienced a large nationwide dengue surge in the past year, the disease remains endemic, with substantial transmission and a long-term rising trend. For decades, dengue control in India relied almost entirely on vector control measures such as eliminating mosquito breeding sites, insecticide use, and public awareness campaigns. While essential, these strategies have had limited success in preventing recurring outbreaks. The arrival of a vaccine, therefore, represents a shift from a reactive to a more preventive approach.

TAK-003 comes with several advantages. It has been evaluated in large global trials involving more than 28,000 participants and has already been approved in more than 40 countries. Importantly, unlike an earlier dengue vaccine, it does not require pre-vaccination screening to determine prior dengue infection, making it simpler to use in real-world settings. The vaccine has also demonstrated good safety and, crucially, strong protection against severe dengue and hospitalisation – both outcomes that matter the most in clinical practice.

In a country like India, where healthcare systems are often stretched during dengue seasons, even a modest reduction in the number of severe cases could have a substantial impact. Fewer hospital admissions, reduced intensive care burden, and lower mortality in children and adolescents would all represent meaningful gains.

Challenges and limitations

However, it is equally important to recognise what this vaccine can and cannot achieve. Dengue is caused by four closely related but distinct viruses, known as serotypes (DENV-1 to DENV-4). Immunity to one serotype does not guarantee protection against the others, and in some cases, can even predispose an individual to more severe disease upon subsequent infection. This makes developing a vaccine for dengue uniquely challenging: an effective vaccine must provide balanced protection against all four serotypes.

Herein lies a key limitation of TAK-003. While it performs very well against the DENV-2 serotype, since it was developed on the DENV-2 backbone, and reasonably well against DENV-1, its effectiveness against DENV-3 and DENV-4 appears to be lower – particularly in individuals who have not previously been infected with dengue.

This is not merely a theoretical concern. India's dengue epidemiology is evolving, with increasing reports of DENV-3 becoming more prominent in several regions.

Recent data from India also show that all four dengue serotypes continue to co-circulate, with DENV-2 still predominant in many regions but DENV-3 contributing a substantial and increasing proportion of cases.

For instance, surveillance from North and Western India has reported DENV-2 accounting for around 48-66% of cases, followed by DENV-3 at around 20-30%, with DENV-1 and DENV-4 contributing smaller shares.

If this trend continues, the overall effectiveness of the vaccine at a population level may be lower than expected. In simple terms, while vaccinated individuals are still likely to be protected from severe disease, they may continue to experience dengue infections, especially during outbreaks dominated by DENV-3.

This distinction is crucial. TAK-003 is best understood as a vaccine that modifies the disease rather than as one that blocks transmission. In other words, it is likely to reduce the severity of illness rather than prevent infection altogether. As a result, dengue outbreaks will not disappear and public health measures such as vector control will remain indispensable.

Another important consideration is cost and access. Dengue vaccines are expected to be relatively expensive, and TAK-003 requires two doses administered three months apart. The expected price of TAK-003 in India is likely ₹3,000-6,000 per dose and ₹6,000-12,000 for the full course. While public programmes may offer the shots at lower prices, questions about affordability and compliance – particularly among lower-income and rural populations – remain unanswered. At least in the initial years, uptake is likely to be limited to the private sector or targeted programmes in areas with a high burden of dengue.

The SEC has appropriately mandated post-marketing safety and effectiveness studies in the Indian population. These will be critical to understand how the vaccine performs in real-world conditions, across different regions and serotype patterns.

Looking ahead, TAK-003 may be only the first step in India's dengue vaccine journey. A second generation of vaccines, based on a different scientific approach developed by the U.S. National Institutes of Health (NIH), is currently under evaluation.

Indian pipeline

India's dengue vaccine pipeline is advancing, with an indigenous candidate called 'DengiAll', developed by Panacea Biotec in collaboration with the Indian Council of Medical Research, currently undergoing large phase III clinical trials.

A similar vaccine has already been approved in Brazil and it has shown strong protection against severe dengue. If the Indian candidate is also successful, it could be available around 2027. These vaccines aim to provide more balanced protection across all four serotypes and may offer the additional advantage of a single-dose regimen.

Early data from similar vaccines tested elsewhere are also promising, particularly in terms of protecting against severe dengue and broader serotype coverage. If these findings are confirmed in Indian trials, such vaccines could be better suited for large-scale public health deployment.

For policymakers, the challenge will be to balance urgency with prudence. There is a clear and immediate need to reduce the burden of severe dengue and TAK-003 is a valuable tool with which to achieve this. At the same time, the long-term strategy must remain flexible, allowing for the country to adopt better vaccines as the evidence evolves.

For clinicians, clear communication will be essential. Their own and their patients' expectations need to be realistic: the vaccine is not a cure-all but it is a meaningful step forward. Even if it does not eliminate dengue, it can save lives and reduce complications.

Ultimately, the introduction of a dengue vaccine in India should be seen not as the culmination of efforts but as the beginning of a new phase. Success will depend not only on the vaccine itself but also on how well it is integrated with surveillance, vector control, and future innovations.

In public health, progress often comes incrementally. TAK-003 may not be the final answer to dengue in India but it is undoubtedly an important start.

(Vipin M. Vashishtha is director and paediatrician, Mangla Hospital and Research Centre, Bijnor)