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PATENT mitra
Patent and Technology Transfer Enabler

A report on

# Indian Biomedical Patent Landscape

## Correlating Innovation with Disease Burden

2016-2025

## Patron

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राज्य मंत्री (स्वतंत्र प्रभार)
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व
राज्य मंत्री
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GOVERNMENT OF INDIA

India's health sector is witnessing a significant transformation driven by demographic changes, evolving disease patterns, technological advancements, and the growing demand for equitable access to quality healthcare services. As we advance towards the vision of a Viksit Bharat, it is crucial that our health policies, research initiatives, and innovations are grounded in strong evidence and forward-thinking analysis.

I commend the Indian Council of Medical Research (ICMR) for publishing this insightful report on the Indian Biomedical Patent Landscape and comparing it with the discase burden. This report is both timely and nationally important, providing a data-driven perspective that links India's public health priorities with emerging trends in biomedical patenting. Patents, beyond their role in protecting intellectual property, serve as vital indicators of research focus, technological progress, and innovation pathways. By correlating India's disease burden with biomedical patent trends, this report offers valuable insights into how well innovation efforts align with public health needs. Such evidence is critical for shaping policy, directing research funding, enhancing domestic innovation capacity, and fostering collaboratin among academia, industry, startups, and public institutions.

Over the last decade, the Government of India under the visionary leadership of Hon'ble Prime Minister Shri Narendra Modi ji has actively promoted innovation-led healthcare development through flagship programs such as Ayushman Bharat, the National Digital Health Mission, Make in India, and supportive policies for pharmaceutical and medical device research, development, and manufacturing. The strategic application of patent intelligence, as demonstrated in this report, can further strengthen these initiatives by identifying translational research opportunities and boosting India's global competitiveness in health technologies.

This report is a valuable resource for policymakers, researchers, innovators, and investors alike. Its insights will aid in setting priorities, guiding funding and program decisions, and fostering the development of affordable, accessible, and contextually relevant health solutions for India. By highlighting patent trends across major diseases, the report advocates for a strategic, patient-centered and future-ready approach to fosterting biomedical research and development.

I am confident that this important study by ICMR will encourage informed dialogue and collaborative action among all stakeholders, contributing to a resilient, inclusive, and innovation-driven health system. I trust that the findings and insights presented here will support India's ongoing journey towards Universal Health Coverage.

I congratulate the ICMR team and all contributors associated with this report and extend my best wishes for the successful utilization of this important knowledge resource in advancing India's biomedical innovation ecosystem.

(Prataprao Jadhav)

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India stands at a defining moment in its journey toward health security and innovation-led growth. Over the past decade, the country has made significant strides in expanding healthcare access, strengthening public health programmes, and building domestic capacities across pharmaceuticals, vaccines, medical devices, and digital health. Yet the scale and complexity of India's disease burden continue to demand sustained, evidence-driven innovation.

ICMR's flagship initiative, 'Medical Innovations Patent Mitra' launched in March 2025, offers expert guidance and comprehensive end-to-end support for patent facilitation and technology transfer, this initiative plays a pivotal role in nurturing and accelerating biomedical innovation nationwide. It significantly strengthens the nation's innovation ecosystem, fostering an environment where groundbreaking medical advancements can thrive and translate into impactful healthcare solutions.

I commend the Indian Council of Medical Research (ICMR) for conceptualizing and delivering this report on the Indian Biomedical Landscape, a first-of-its-kind national study, that brings together disease burden and patent intelligence in a rigorous and policy-relevant manner. This report reflects a forward-looking effort to position Intellectual Property (IP) as a strategic tool for public health planning and biomedical innovation.

By systematically mapping patented biomedical technologies against disease burden, measured in Disability-Adjusted Life Years (DALYs), the report offers a novel lens to assess how innovation pathways align with national health priorities. It highlights areas of notable progress, while also drawing attention to diseases where innovation efforts have yet to scale in proportion to public health need. Such insights are vital for ensuring that India's growing innovation capacity translates into meaningful, population-level health impact.

The analysis presented here reinforces the importance of viewing patents not in isolation, but as part of a broader translation continuum from research to regulation, manufacturing, deployment, and population-level impact. India has taken important policy steps in this direction. National initiatives promoting biotechnology, Medtech innovation, domestic manufacturing, digital health, and regulatory modernization have begun to lay the foundation for a more integrated innovation ecosystem.

I am thankful to technical experts of the Program Management Unit of Medical Innovations Patent Mitra for preparing this report. I would also like to extend my heartfelt appreciation to the Innovation and Translation Research (ITR) Unit of ICMR. Their tireless efforts and meticulous dedication in undertaking this study have been instrumental in bringing this insightful report to fruition.

This report offers valuable evidence base for policymakers, research institutions, industry, and funding agencies. It provides direction for prioritizing investment, aligning innovation incentives with disease burden, and accelerating the journey from ideas to impact.

Rajiv Bahl

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# About DHR and ICMR

The Department of Health Research (DHR) was created as a separate department under the Ministry of Health & Family Welfare in 2007. The DHR aims to bring modern health technologies to the people through research and innovations related to diagnosis, treatment methods, therapeutics and vaccines for prevention; to translate them into products and processes and, in synergy with concerned organizations, introduce these innovations into the public health system. DHR also has the mandate of promoting inter-sectoral coordination and promotion of public-private partnership in medical, biomedical and health research-related areas.

The Indian Council of Medical Research (ICMR), is an autonomous organization under the DHR for the planning, promoting, coordinating and conducting biomedical research in India. The objectives of ICMR are in consonance with the National Health policy and aim towards improving the health of the people of India through biomedical research. ICMR, established in 1911, is one of the oldest medical research organizations in the world, with a broad mandate to generate new knowledge through the conduct and support of biomedical research in all areas that would have a bearing on improving the health of Indian people. The Council carries out its mandate through its network of institutes/centres, extramural research support to investigators at various institutes and medical colleges in India, and through active international collaborations. ICMR has been actively fostering biomedical innovation through translational research, technology development, validation, and strategic partnerships aimed at addressing national healthcare priorities.

Medical Innovations Patent Mitra, initiated in 2025 is one the flagship initiatives of ICMR for fostering Biomedical Innovations in India. It is a centralized, expert-driven platform that supports Patent filing, prosecution, maintenance and transfer of technologies for societal impact. This initiative provides handholding support to innovators for quality patent filing(s), its strategic management, and technology transfer to ensure that innovations developed under ICMR's Intramural Research, ICMR-supported Extramural Research, Medical Colleges or Medical Institutes, Start-ups registered with DPIIT and Institute-led biomedical Innovators across the country are fully leveraged.

# Executive Summary

# Executive Summary

**Study at a glance**

**57,000+**
Patent records identified

**Disease areas analysed**

- Communicable Diseases (CDs)
- Non-communicable Diseases (NCDs)
- Maternal, Neonatal & Nutritional Disorders

**Patent categories covered**

- Diagnostics
- Medical devices
- Therapeutics
- Vaccines

## A first-of-its-kind landscape study analyses biomedical patents filed and granted in India in the ten-year period from 2016 till 2025.

Innovation enables the translation of ideas into real world impact by fostering solutions that strengthen systems, respond to unmet needs, and generate sustained societal and economic value, whether through disruptive breakthroughs or incremental advances. Patents serve as an important indicator of innovation, as they reflect the generation of novel, non obvious, and industrially applicable knowledge. By granting time bound exclusive rights, patents signal both inventive activity and incentivize investments in research and development, while also facilitating knowledge disclosure and future technological advancement.

For India, which faces a growing and complex burden of communicable, non communicable, and maternal child health challenges amid expanding healthcare demands, innovation is a critical foundation for sustainable development, public health resilience, and global competitiveness. The report recognizes biomedical innovation as a key enabler in addressing these challenges, emphasizing how patents not only protect inventions and create incentives for innovators, but also support the translation of scientific discoveries into accessible, real world healthcare solutions.

This first of its kind landscape study analyses biomedical patents filed and granted in India in the ten-year period from 2016 till 2025. Using a multi-source patent search strategy across global and Indian databases, the study identified over 57,000 relevant patent records spanning Diagnostics, Medical devices, Therapeutics, and Vaccines. These patents cover Communicable diseases (CDs), Non-communicable diseases (NCDs), and Maternal, Neonatal, and Nutritional deficiency disorders, and were analysed in comparison with the disease burden in India. Disease burden is measured in Disability Adjusted Life Years (DALYs), from the Global Burden of Disease (GBD) framework, to ensure globally comparable analysis.

Globally, patent grants are concentrated in developed economies, with India contributing only about 2–3% of total patents and close to 1% patents in biomedical domain. While India has improved overall patent filings and innovation rankings, the limited share of biomedical patents within its Intellectual Property (IP) portfolio points to gaps in innovation protection, incentives for patenting high value research, and mechanisms that support translation and commercialization, particularly in the biomedical sector in the country.

## 1 Trends in biomedical innovation in India (2016–2025)

Biomedical patent activity in India has improved considerably in the last ten years, with a marked increase after the year 2020. Government initiatives, regulatory reforms, and the digital transformation of patenting processes are collectively strengthening institutional research output and creating a more enabling ecosystem, with targeted incentives and policies designed to streamline the transition from patented innovations to market ready products.

The analysis in the present report has shown that therapeutics and medical devices dominate patent filings and grants in India, with medical devices showing the highest growth in granted patents and strongest translational efficiency. Diagnostics display steady but fragmented growth, while vaccines remain the most constrained domain mainly due to high cost, long development timelines, and regulatory complexity.

## 2 Mapping India's disease burden against biomedical innovation

By mapping DALYs against granted patents, the report tries to capture the major diseases and key areas of focus where further push is needed in terms of biomedical innovation. This section identifies significant "innovation white spaces" where high disease burden intersects with low patent activity.

### Communicable Diseases

Tuberculosis (TB) and Vector borne diseases (VBD) contribute significantly to disease burden (as evident by the high DALYs) but show modest patent activity relative to the disease burden. This contrast is clearly visible when we compare the disease burden vis-à-vis patent activity of Sexually Transmitted Diseases, Hepatitis, and Tuberculosis.

### Non-Comunicable Diseases

Cardiovascular disease, Diabetes, Chronic Obstructive Pulmonary Disease (COPD), and Mental health disorders show extremely high disease burden but relatively low patenting, whereas cancer shows a more balanced alignment most likely due to higher R&D investment.

### Maternal, Neonatal, and Nutritional Disorders

Neonatal disorders have higher disease burden but show low patent activity in this category, highlighting an opportunity for more innovation and policy support at a life stage where early interventions yield lifelong benefits.

## 3 Working of patents and commercialization

An analysis of patent working disclosures submitted to the Indian Patent Office suggests that a substantial share of granted biomedical patents have yet to progress toward commercialization, with limited reporting on active patent use. Across the three major disease areas mentioned above, about 80% of granted biomedical patents remain uncommercialized, largely residing within industry portfolios where commercialization may not be an immediate priority, often influenced by low perceived market incentives. A smaller share, approximately 10%, is held by academic and public research institutions, where challenges related to scale up, licensing, and technology transfer persist. Collectively, these patterns point to a persistent patent to market gap, reinforcing the need to strengthen enabling mechanisms such as structured commercialization pathways, improved licensing frameworks, and sustained public private collaboration to translate patented knowledge into tangible health outcomes.

## 4 Biomedical innovations and public health impact

While the focus of this study is predominantly towards Patents and their correlation with Disease burden, some interesting observations emerged as Ancillary insights.

As an additional part of this study, the research team also investigated leading technologies which have made significant impact on high priority diseases from a public health standpoint. While a majority of the technologies were backed by patents, some of the most impactful innovations which made significant contribution in addressing the public health needs are not patented.

During this study, it was observed that leading government institutions and departments such as ICMR, DBT-BIRAC, DST and CSIR have consistently prioritized the public health needs of the country and have facilitated the development and dissemination of technologies driven by unmet public health needs, rather than being guided by patenting considerations. Their core mandate is meeting the public health challenges of the country and addressing the high disease burden, while fostering development and commercialisation of technologies including medical countermeasures for the containment of communicable diseases during epidemics and pandemics.

While patents are considered as key supportive tools to safeguard innovation, they are not prioritized over public health needs. Instead, there has been an emphasis in ensuring that technologies are rapidly available to the vast population, nationally and globally. In situations of public health urgencies, such as pandemics, the focus pivots to rapid access, scale up, and deployment of life saving solutions.

Some examples which illustrate this approach include COVID Kavach IgG ELISA kit (ICMR), the Japanese Encephalitis ELISA kit (ICMR), diagnostic kits for Hepatitis A & E, and Rotavirus (ICMR); rapid diagnostic tests for Haemophilia A & Von Willebrand disease (ICMR-DBT BIRAC); and the Divya Nayan visually impaired reading machine (CSIR). [21]

## 5 Conclusion

India stands at a pivotal juncture where a high disease burden intersects with expanding scientific capability, globally harmonized regulation, and growing policy support. The imperative now extends beyond generating patents to strategically channelling innovation towards the country's most pressing health needs and ensuring its timely translation into market ready solutions. By aligning R&D investments with high burden diseases, strengthening patent to product pathways, and effectively operationalizing working of patent provisions, India can transform its latent innovation potential into sustained, measurable gains in public health outcomes.

Chapter

01

# Introduction

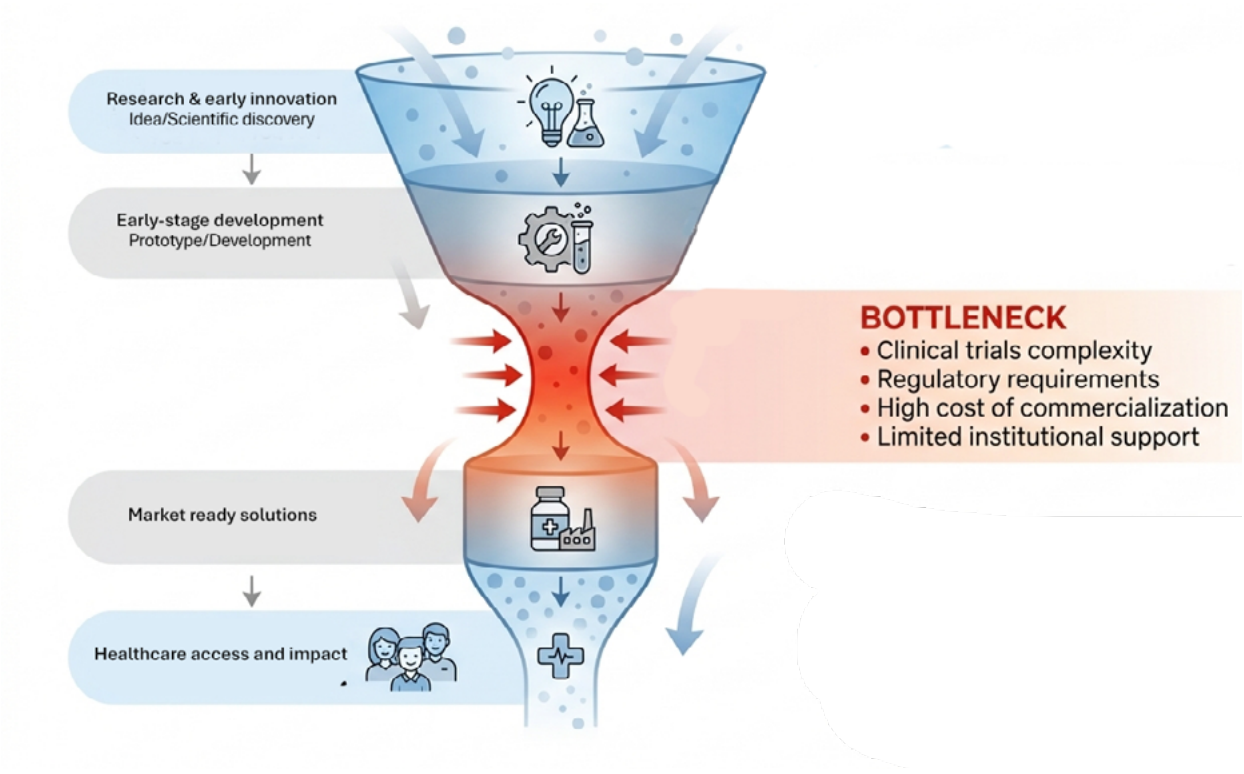
# 1 Introduction

Innovation transforms ideas into real world by enabling solutions that strengthen systems, address unmet needs, and create sustained societal and economic value, whether through disruptive breakthroughs or incremental improvements. In a country like India which is facing a growing burden of diseases alongside widening healthcare demands, innovation is a critical foundation for sustainable development, public health resilience, and global competitiveness [1]. By enabling new and improved technologies, innovation enhances productivity, improves quality of life, and supports long term growth across healthcare and allied sectors.

Innovations that are novel, inventive, and non obvious, and that have not been previously disclosed, are eligible for patent protection. Patents serve as a cornerstone of innovation security, granting inventors exclusive, enforceable rights that reduce investment risk, attract capital, and enable the confident development and scale up of new technologies. This structured framework of protection and disclosure safeguards originality, rewards ingenuity, and converts high risk ideas into viable solutions, ensuring that innovators are incentivized while society benefits from the diffusion and application of new knowledge.

## 1.1 The strategic importance of patents in biomedical innovation

Biomedical innovation encompassing drugs, vaccines, diagnostics, medical devices, and digital health technologies form the foundation of modern healthcare systems. However, the translation of scientific discoveries into disease-relevant solutions is inherently complex and highly resource-intensive within the biomedical sector. In India, many promising early-stage biomedical innovations struggle to progress beyond the laboratory stage, largely due to limited institutional capacity to support high-risk, long-term research and development (R&D). These challenges are further intensified by the need to navigate multi-phase clinical trials, comply with stringent regulatory requirements, and manage costly commercialization pathways.



In the biomedical sector, patents are widely used as indicators of innovation activity because they represent ideas and scientific knowledge which in-turn lead to real, usable inventions. Innovation starts with ideas that identify unmet medical or healthcare system needs. These ideas are then developed through inventiveness into practical solutions such as new medicines, diagnostic tests, medical devices, or healthcare technologies. When these solutions are patented, it shows that the innovation has moved beyond research and has reached a stage where it is technically sound and ready for further development or use.

Patents also help show where innovation efforts are being focused. Unlike research publications or R&D spending, which mainly reflect early stage research or investment, patents represent concrete inventive outcomes with real world application potential. In the biomedical sector, where development takes time, regulations are strict, and costs are high, filing a patent signals a serious commitment to translate innovation into practical healthcare solutions.

While other measures such as R&D investment, clinical trials, and product approvals are important for understanding different stages of innovation, patents remain one of the most reliable and consistent indicators of innovation activity. They provide a clear, standardized way to track technological progress and to understand how ideas and inventiveness are being transformed into innovations that can address public health needs.

In this context, robust and predictable intellectual property protection, particularly through patents, assumes critical importance. By safeguarding inventions from unlicensed replication, reducing uncertainty, and enabling sustained investment, strong IPR frameworks can empower innovators to overcome structural and financial barriers along the innovation pipeline. Consequently, effective innovation protection acts as a key enabler for the development and translation of biomedical solutions, especially in India, where high disease burden coexists with significant unmet medical needs and emerging market opportunities. [1,3]

According to the Institute for Health Metrics and Evaluation (IHME), India continues to shoulder a substantial burden of both communicable and non communicable diseases [4] alongside women and child health, making sustained biomedical innovation essential for reducing neonatal mortality, improving chronic disease management, and strengthening pandemic preparedness. Global frameworks including those highlighted by the World Intellectual Property Organization (WIPO) underscore the importance of harmonizing patents with mechanisms such as trade secret protections to balance innovation incentives with effective knowledge sharing and commercialization. [5,6]

Collectively, these dynamics illustrate the central role of innovation and intellectual property systems in shaping India's ability to respond to current and emerging health challenges. Strengthening biomedical research, ensuring effective IP frameworks, and accelerating translation from laboratory discoveries to market ready solutions are therefore critical to improving health outcomes and enhancing national resilience.

## 1.2 India's position in the global innovation landscape, biomedical patent share and India's disease burden

**While 47% of patent applications filed during 2021–26 were granted, only 4% of these grants were related to biomedical innovation**

India's pace of innovation is steadily accelerating. From 2016 to 2025, the Indian Patent Office received 724,248 patent applications, while 343,689 patents were granted during this period. These granted patents are not a subset of the applications filed within this timeframe, as many of them correspond to filings from earlier years. The numbers however indicate expanded R&D activity and growing awareness of IP strategies.[7][8] Policy efforts such as the BioE3 (Biotechnology for Economy, Environment & Employment) and Biopharma Shakti initiatives, along with updated clinical trial regulations, are likely to strengthen India's capacity as a global biotech hub.[8] India is ranked 38th globally in the Global Innovation Index (GII) 2025, released by the World Intellectual Property Organization (WIPO), reflecting a remarkable improvement from its 66th position in 2016. Moreover, India continues to retain its leadership position in the Central and Southern Asia region, underscoring its steady shift from generic manufacturing toward a more indigenous,

innovation driven ecosystem. [19,20]

Despite overall growth in patent filings, biomedical innovation remains relatively limited within India's patent landscape. In the past decade, of the 724,248 applications filed, only 6% pertained to biomedical technologies, and just 4% of all patents granted during this period fell within this domain, highlighting a notable mismatch between India's disease burden and its innovation output. [7] This lag suggests that health-focused inventions are not being prioritized adequately within the innovation ecosystem.

India continues to face a substantial health burden across conditions such as tuberculosis, HIV, malaria, dengue, cancer, cardiovascular disease, and diabetes many of which are priority areas under national health programmes and ICMR research frameworks. Yet, diagnostic tools are often centralized, therapeutic monitoring remains fragmented, and preventative technologies, including vaccines, continue to face availability and access challenges despite existing patented innovations globally. [4,8]

## 1.3 From patents to impact: overcoming translation barriers and innovation gaps

Another continuing challenge is the under-utilization of granted patents, many biomedical inventions remaining unworked, retained within industry portfolios or confined to laboratories without translating into improvements in healthcare delivery. Although the Indian Patents Act provides Compulsory licensing provisions to address such situations, this mechanism has been invoked only once, in 2012, for Sorafenib tosylate (NEXAVAR) to enable affordable access to a life saving cancer drug. [7] The limited application of this provision suggests that the potential of protected intellectual property to be converted into widely accessible health technologies is yet to be fully realized.

To address the gap between biomedical innovation and India's healthcare needs, it is essential to strengthen the national intellectual property ecosystem through a coordinated strategy. Targeted R&D funding, early-stage IP and technology transfer support, and assistance with regulatory and clinical pathways can help translate promising inventions into real-world solutions. Where access gaps persist, the judicious use of compulsory licensing under Sections 84–92 of the Indian Patents Act remains an important public health safeguard. In addition, government use provisions (often referred to as "march-in rights") under Sections 100 and 102 enable the Central Government to authorize the use or acquisition of patents in public interest, including for healthcare emergencies. Further, the exclusionary standards under Sections 3 and 4, such as the prohibition of evergreening under Section 3(d) and exclusion of inventions contrary to public order or morality under section 3 (b) ensure that only genuine innovations receive protection, thereby maintaining a balance between private rights and public health needs. By aligning these IP flexibilities with national health priorities, patents can be transformed into active drivers of innovation and population-level health impact.

Chapter

02

# Scope and Methodology

# 2 Scope and Methodology

## 2.1 Scope of biomedical patent landscape

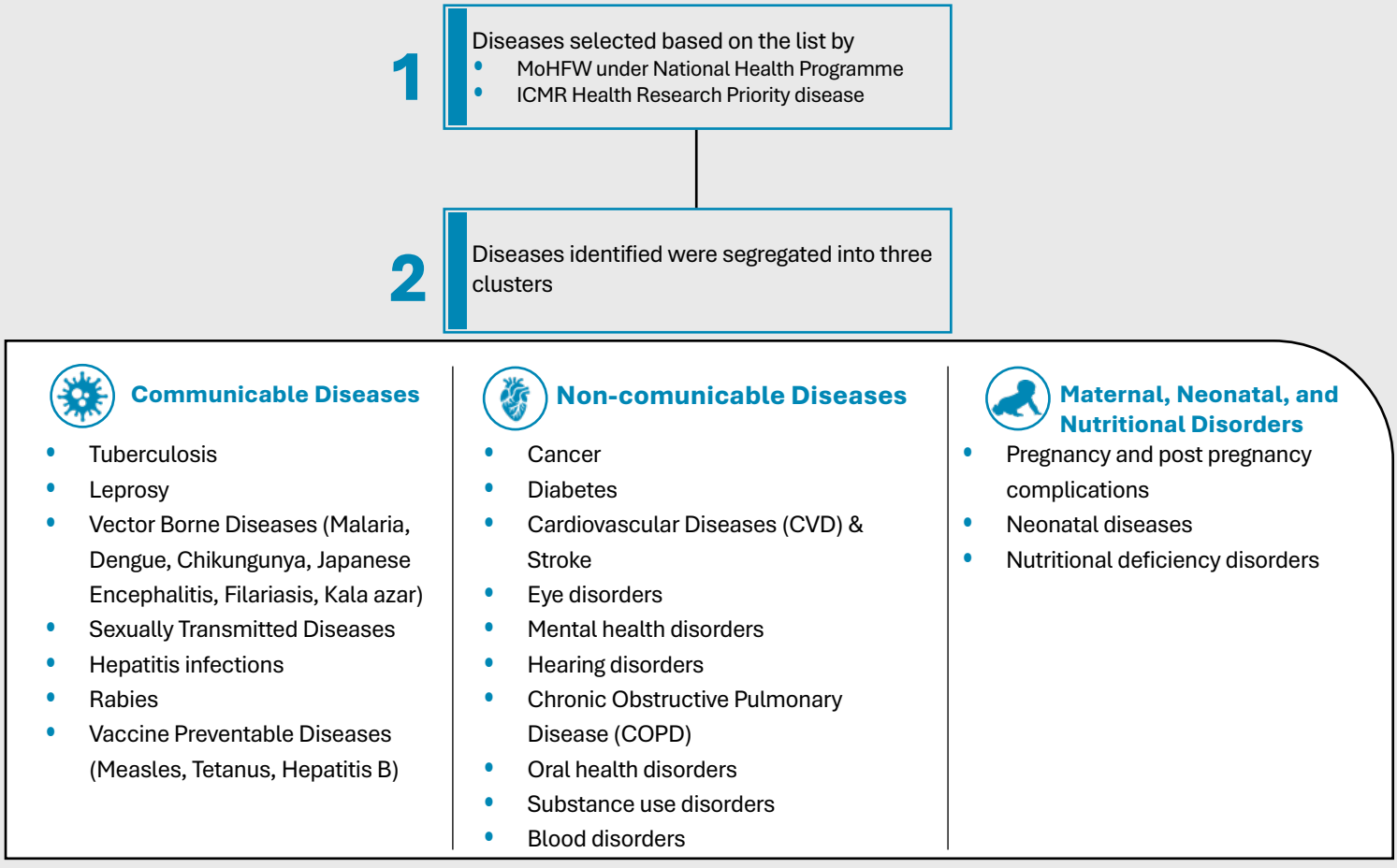
This study is the first of its kind to analyse biomedical patents filed and granted in India over a ten year period (2016–2025)- a decade that saw major national initiatives aimed at strengthening the country's biomedical innovation ecosystem. Key developments during this period included the launch of 'ICMR MedTech Mitra' (2023), the expansion of 'BIRAC-DBT innovation and clinical validation programmes' (2012–2025), the establishment of 'Medical device testing and evaluation centres' (2020), and the introduction of the PLI scheme for medical devices (2021). Collectively, these efforts expanded India's capacity for research, regulatory navigation, and translation of biomedical technologies from lab to the market.

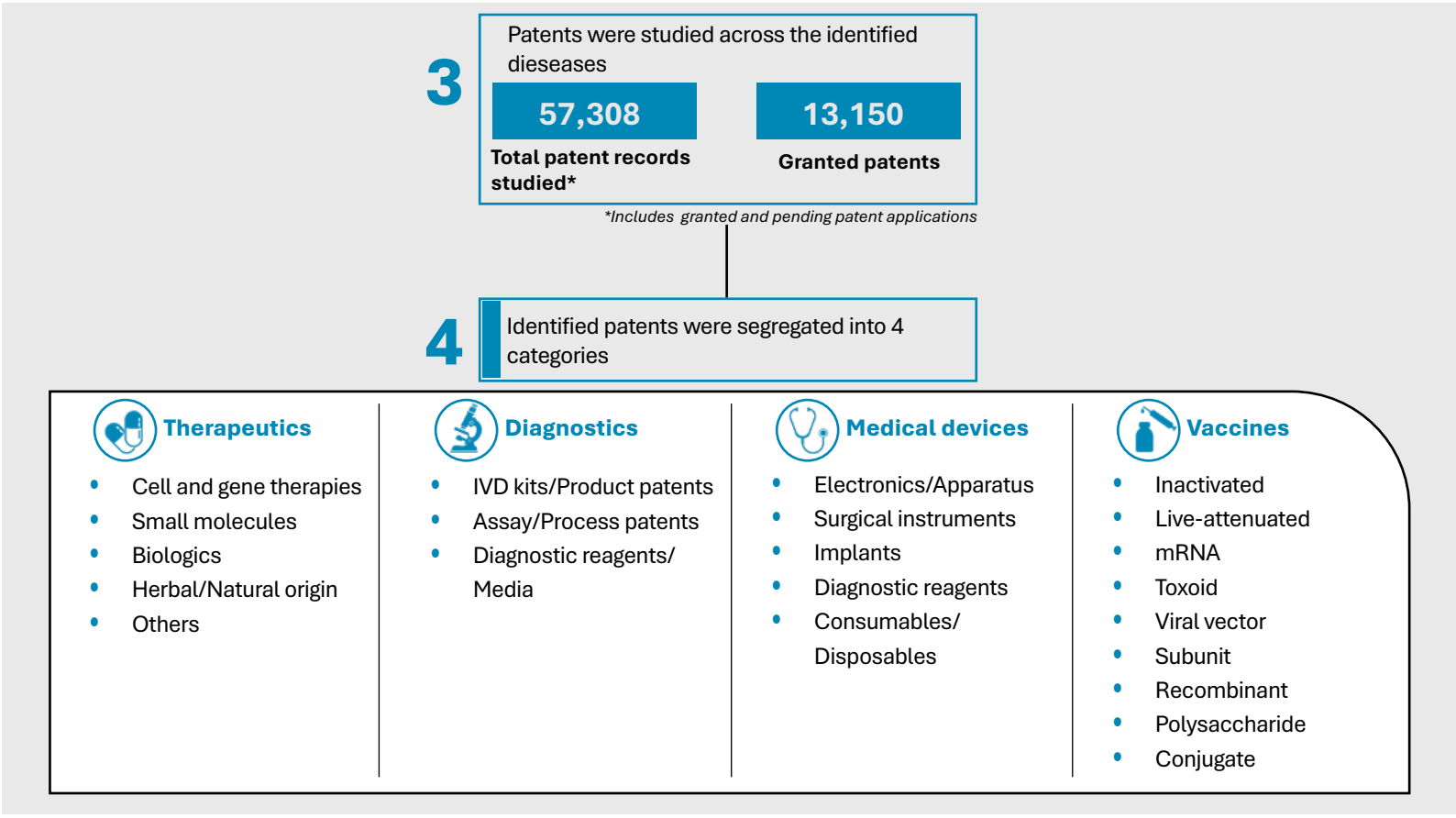
The study examined patent applications filed, and patents granted by the Indian Patent Office between January 1, 2016, and December 31, 2025. The analysis was restricted to four core biomedical domains-Diagnostics, Medical devices, Therapeutics and Vaccines.

## 2.2 Disease areas and conditions

To ensure alignment with health priorities of the country, the diseases analysed were selected based on those listed by the Ministry of Health and Family Welfare (MoHFW) under National Health Programme areas, as well as those identified within the Indian Council of Medical Research (ICMR)'s Health Research Priority disease areas.[11,12] Disease burden estimates (DALYs) of these diseases in India were sourced from the Institute for Health Metrics and Evaluation (IHME), Global Burden of Disease (GBD) platform to ensure standardized and globally comparable metrics. [4]

***Figure 2.1*** *Process flow of the study*






## 2.3 Analytical approach

The granted patents were further analysed to identify innovation hotspots, technological white spaces, and under represented disease areas. To deepen this assessment, the granted patents were also analysed in detail to identify their underlying subcategories across therapeutics, diagnostics, medical devices, and vaccines, providing clarity on the technological directions driving India's biomedical innovation pipeline. In therapeutics, patents were categorized as small molecule, biologics, herbal or natural origin products, and emerging modalities such as cell and gene therapies. The diagnostics domain was segmented into diagnostic kits, assay based platforms, and diagnostic reagents, capturing both point of care and laboratory oriented innovations. For medical devices, the analysis covered electronics and apparatus-based systems, consumables, implants, and surgical instruments and diagnostic reagents, reflecting the diversity of device level solutions. In the vaccine domain, patents were categorized as inactivated, live-attenuated, recombinant, polysaccharide, conjugate, viral vector, and nucleic acid vaccines (DNA or mRNA) technologies. This structured categorization provided a clearer view of where innovation is concentrated, where gaps persist, and how the overall patent landscape aligns with India's national health priorities and unmet clinical needs.

## 2.4 Search strategy and patent data sources

To operationalize the scope, disease specific keywords across communicable diseases (CDs), non-communicable diseases (NCDs), and maternal, neonatal, nutritional disorders were identified and incorporated into structured patent search queries to capture relevant patents related to therapeutics, vaccines, diagnostics, and medical devices for these conditions. The retrieved results were subjected to a rigorous systematic review of patent titles, abstracts, and claims to ensure accurate disease mapping and to minimize classification risks. These searches were run across multiple databases and refined using disease specific IPC (International Patent Classification) and CPC (Cooperative Patent Classification) codes to enhance precision and minimize irrelevant results.

The study used a combination of paid and open access patent databases, including:

1. **Questel Orbit** (Commercial database) *
2. **InPASS (**Indian Patent Office)
3. **Espacenet** (European Patent Office)
4. **PATENTSCOPE** (World Intellectual Property Organization (WIPO)
5. **USPTO (**United States Patent and Trademark Office)
6. **Google Patents**

**One member per FAMPAT Patent Family utilized for analysis*

This multisource search strategy identified 57,308 patent records associated with inventions relevant to, though not necessarily explicitly claiming, ICMR health research priority diseases and National Health Programme areas, spanning therapeutics, vaccines, diagnostics, and medical devices. Of these, 43,798 were patent applications and 13,510 were granted patents. Triangulating across different search sites and platforms reduced duplication, improved completeness, and ensured coverage of patents filed by both domestic and foreign applicants operating in India.

Key Insights

A total of **57,308 relevant patent records were identified** through a multisource search strategy covering diseases listed in the Ministry of Health and Family Welfare (MoHFW) National Health Programme areas, as well as health research priority disease areas identified by the Indian Council of Medical Research (ICMR), spanning diagnostics, medical devices, therapeutics and vaccines. Of these, 43,798 were patent applications and **13,510 were granted patents**.

Chapter

03

# India’s Biomedical Patent Ecosystem: Macro View

# 3 India's Biomedical Patent Ecosystem: Macro View

## 3.1 Global filings vs India filings (2016 - 2025)

An analysis of the global patent landscape shows that when China is excluded from the analysis due to the atypical scale and nature of its filings, advanced economies such as the USA, the European Union and Japan together account for nearly 70% of all granted patents between January 1, 2016, and December 31, 2025. Across all technology domains, the United States dominates global patent grants, accounting for 42% of total grants, followed by the European Union (14%), Japan (13%), and Korea (5%), with India contributing around 3%. This distribution underscores the continued leadership of mature innovation ecosystems with strong research infrastructure, sustained R&D investment, and well-established mechanisms for translating scientific discovery into protected intellectual property. The remaining 23% share held by the Rest of the World (RoW) nevertheless signals the gradual diffusion of innovation capabilities beyond traditional technology hubs.

Similarly, when the analysis narrows specifically to biomedical patents, the geographic distribution changes somewhat, with the USA remaining the global leader with 40% of granted biomedical patents, followed by the European Union (16%), Japan (10%), and Korea (4%) with the share of RoW increasing to 29%. This shift indicates increasing participation from emerging and middle-income economies in biomedical research, particularly in areas such as diagnostics, digital health, and platform-based technologies.

***Figure 3.1*** *Patent share across the world*

### Global patent share*

Between 2016 and 2025, the United States, the European Union, and Japan together represented nearly **70%** of all patents filed worldwide with India contributing 3% share.

| 42% | 14% | 13% | 5% | 3% | 23% |
|---|---|---|---|---|---|
| United States of America | European Union | Japan | Korea | India | Rest of the World |

### Global biomedical patent share*

USA, European Union and Japan together contribute about **66%** of overall biomedical patents in the same period, with India contributing 1% share.

| 40% | 16% | 10% | 4% | 1% | 29% |
|---|---|---|---|---|---|
| United States of America | European Union | Japan | Korea | India | Rest of the World |

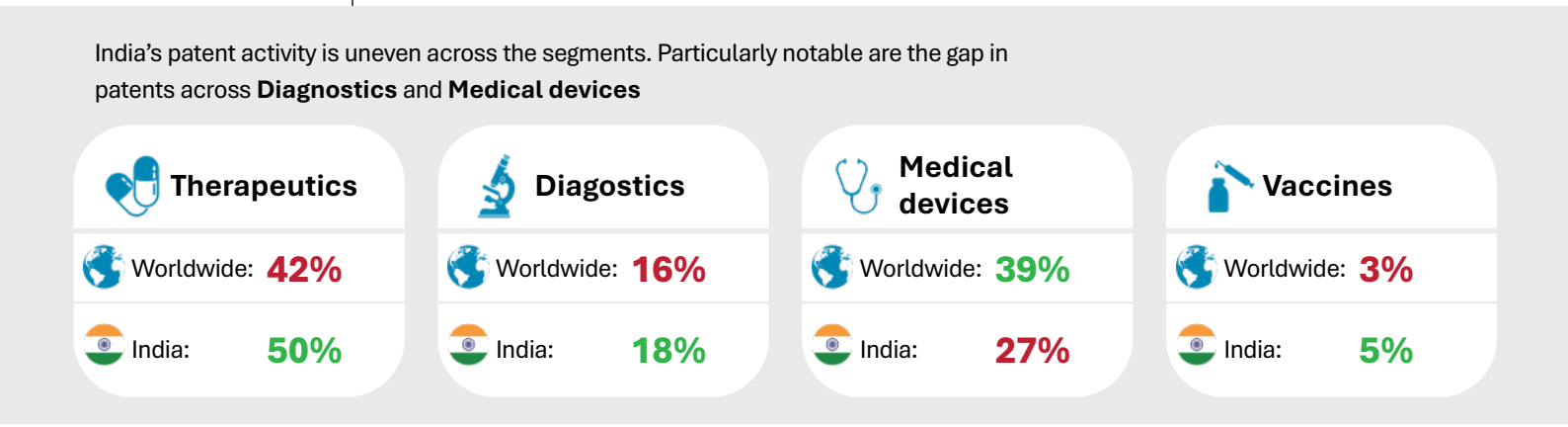
**The global share excludes the patents filed by China*

India's share, however, contracts sharply in this domain, declining from 3% of overall global patent grants to just 1% of global biomedical patents. This divergence highlights a critical asymmetry between India's expanding general innovation capacity and its limited presence in high value biomedical patenting at the global level. Despite having a substantial domestic pharmaceutical and medical devices industry, a strong academic research base, and significant unmet public health needs, India's biomedical patent output remains low relative to global leaders. This contrast points less to a deficit in scientific activity and more to persistent structural constraints in translational research, clinical validation, regulatory navigation, and scale up pathways.

Across specific biomedical categories i.e. Therapeutics, Vaccines, Medical devices, and Diagnostics, global trends reveal preferential concentration in therapeutics and advanced diagnostics, particularly in the US and Europe, where biologics, precision medicine, and molecular diagnostics dominate patent filings. Japan and Korea exhibit relatively higher contributions in medical devices and health-technology integration, leveraging strong engineering capabilities. In contrast, biomedical patenting in India remains fragmented across categories, with limited depth and continuity, suggesting that innovation efforts are often episodic, localized, or insufficiently scaled to generate sustained patent portfolios.

Figure 3.2 further contextualizes this disparity by illustrating the contrast between worldwide biomedical patent distributions and India's domestic patent footprint across key biomedical categories. While global innovation shows broad-based engagement across vaccines, therapeutics, devices, and diagnostics, India's patenting activity is uneven across these segments. This gap is particularly notable in diagnostics and advanced medical devices areas that are directly relevant to India's disease burden yet remain underrepresented in patent grants.

***Figure 3.2*** *Distribution of patents in various biomedical categories - Worldwide Vs India*




Taken together, these patterns emphasize that India's challenge is not a lack of innovation potential but rather the need for targeted strengthening of biomedical innovation pipelines from research and patenting to commercialization and global positioning. The contrast between global and Indian shares underscores the importance of policy interventions that incentivize disease-oriented R&D, strengthen academia–industry linkages, and support the translation of biomedical inventions into scalable technologies. Understanding this differential landscape provides a critical foundation for identifying gaps, white spaces, and strategic opportunities to enhance India's role in global biomedical innovation.

Recognizing these gaps, the Indian government has introduced targeted policy interventions to strengthen the research to market pipeline in biomedical and Med tech innovation. Initiatives such as MedTech Mitra and schemes by the Department of Pharmaceuticals (DoP) provide end to end support for regulatory facilitation, clinical validation, and proof of concept development, particularly for domestically developed devices and diagnostics. These efforts are reinforced by broader translational programmes, including BIRAC's Biotechnology Innovation Grant scheme, National Biopharma Mission, BioNEST incubators, medical device parks, and streamlined regulatory pathways through CDSCO, collectively lowering barriers for innovators.

Chapter

04

# Trends in Biomedical Innovation in India (2016-2025)

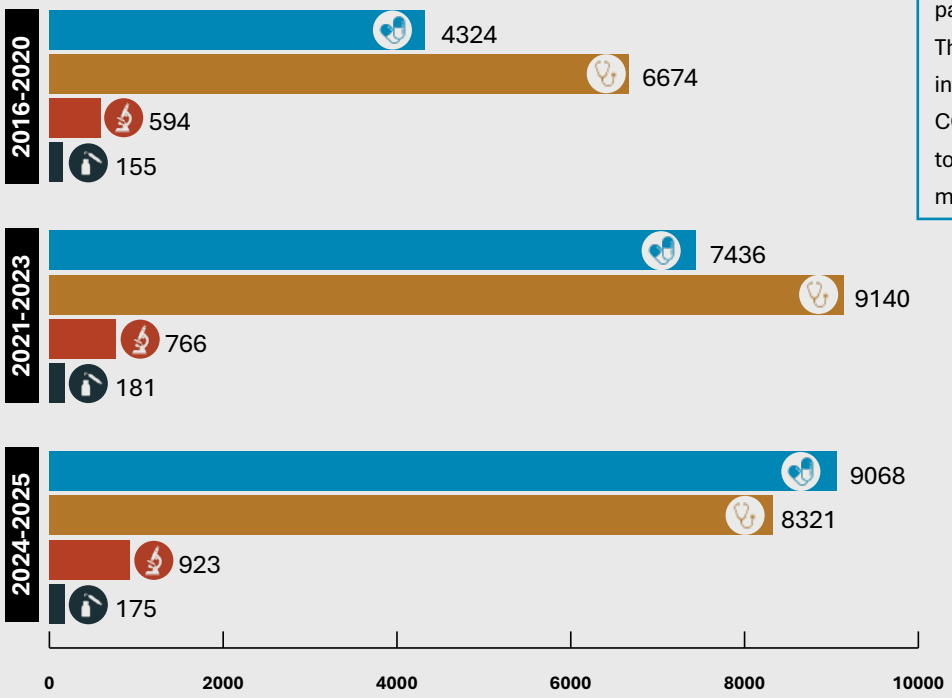
# 4 Trends in Biomedical Innovation in India (2016-25)

The patent filing and grant trends between 2016 and 2025 reflect a clear expansion of biomedical patent activity in India, with differentiated growth patterns across the four key domains Therapeutics, Medical devices, Diagnostics, and Vaccines. Taken together, these trends indicate not only rising research output but also evolving translational capacity within the Indian innovation ecosystem, particularly in the post-2020 period.

***Figure 4.1*** *Trends in applications filed and patents granted*

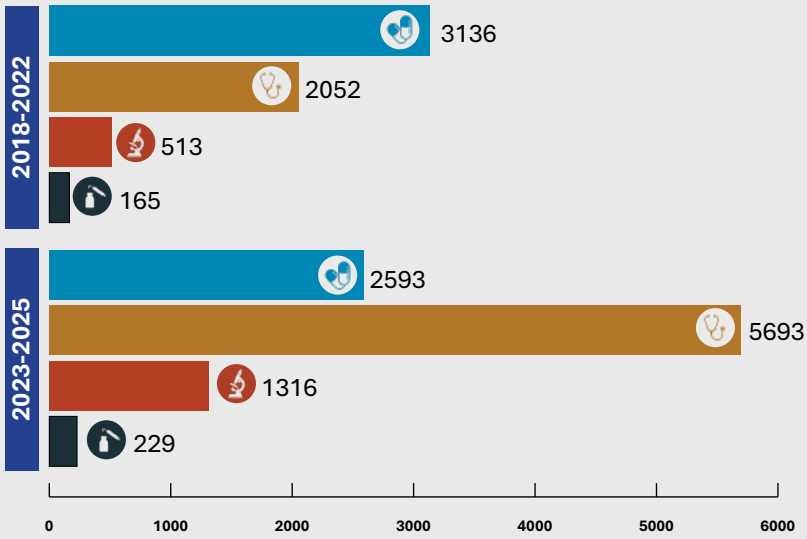
## Trends of patent applications filed*

*Filing data for 2024-25 may be incomplete due to 18 months lag between the filing and publication of patent application.
The time frame represented in the graph, is divided into three periods i.e. pre-COVID (2016-2020), COVID (2021-2023), and post-COVID (2024-2025) to help identify any shifts in innovation activity that may have occurred because of the pandemic.




## Trends of granted patents

A time lag of **24** months (or) more indicates the earliest point at which the filings could have been granted.




**Legend**
- Therapeutics
- Medical devices
- Diagnostics
- Vaccines

Across all four biomedical domains, the innovation trajectory in India shows a transition from early, incremental momentum to a distinct post-2020 acceleration, indicating a structural strengthening of research, patenting, and translational activity rather than a short-term surge.

The patent applications filed in the biomedical domain have risen consistently over the three periods (2016-20, 2021-23, and 2024-25) mentioned above, with a marked acceleration after 2020. This inflection coincides with the COVID-19 pandemic, which acted as a systemic shock exposing gaps in healthcare infrastructure while simultaneously catalysing innovation, regulatory flexibility, and public–private collaboration. The sustained increase in filings beyond the pandemic phase suggests that this was not a temporary spike, but the beginning of a structurally stronger biomedical R&D pipeline in India.

The rise in patent grants between 2018-22 and 2023-25 is indicative of improved institutional throughput at the Indian Patent Office and a gradual increase in the proportion of applications reaching grant stage, aided in part by procedural efficiencies such as the adoption of online hearings and digitised examination processes. Medical devices and therapeutics are the two dominant pillars of India's biomedical patenting activity, demonstrating strong and sustained growth across successive periods.

Medical devices represent the fastest-growing and most dynamically evolving biomedical domain in India. Patent filings in this segment showed a sharp surge post-2020, indicating strong entry of new innovators and technologies, superior translational efficiency from invention to granted protection. This acceleration reflects a strategic shift toward device-based healthcare solutions including diagnostics-enabled devices, wearables, implants, imaging systems, and digital physical health technologies supported by favourable policy interventions and pandemic-driven decentralised care needs. The strong grant rate in medical devices makes it the leading domain for near-term commercialization and technology transfer to industries.

In therapeutic domain, patent application filings show a sharp increase post-2020, reflecting continued momentum in small molecules, formulations, biologics, drug-delivery systems, and repurposed therapies. Patent grants maintained a relatively high filing-to-grant conversion rate, which indicates maturity in scientific depth, regulatory familiarity, and prosecution quality. However, the overall growth pattern suggests that while therapeutic innovation is expanding steadily, it remains largely incremental in nature, reflecting India's historically strong but conservative pharmaceutical innovation model.

Diagnostics show steady and consistent growth, with respect to both patent applications and granted patents. Notably, the grant rate in diagnostics shown a significant improvement in recent years, indicating better recognition, examination outcomes, and patent quality. Despite this positive trend, diagnostics continue to account for a smaller share of overall biomedical patenting activity when compared to therapeutics and medical devices. This pattern suggests that diagnostic innovation in India is broad-based but fragmented, often focused on point-of-care tools, biosensors, and platform-level solutions without large integrated portfolios. Despite the close alignment of diagnostics with India's disease burden and public health priorities, this domain remains relatively underexploited as an avenue for scalable and deployment-oriented innovation.

Vaccines remain the most constrained domain within India's biomedical patent landscape. Patent filings show only a marginal growth over time, followed by stabilization, while grants increase at a modest and slower rate relative to other domains. This relatively low level of patenting activity does not indicate limited strategic importance; rather, it reflects the presence of structural barriers, including extended development timelines, high clinical trial costs, manufacturing complexity, and stringent regulatory requirements. The observed trend suggests that India's vaccine ecosystem remains primarily oriented toward process optimisation, manufacturing scale-up, and incremental innovation,

rather than platform-based or breakthrough patent-driven innovation. Bridging this gap will require targeted R&D incentives, sustained investment, and long-term platform support to strengthen upstream innovation and inventive capacity.

In addition to domain-specific drivers, the expansion of India's biomedical patent landscape has been substantially enabled by systemic and institutional reforms introduced over the past decade. The post-2020 acceleration in patent filings and grants coincides with clearer regulatory pathways, improved predictability in approval processes, and a more systematic functioning of the Indian Patent Office. Measures such as expanded use of online hearings, digital submission systems, expedited examination mechanisms, and time-bound prosecution have reduced procedural friction and increased confidence among innovators. These operational improvements have directly contributed to higher patent filing to grant conversion rates, particularly in domains such as medical devices and diagnostics where faster examination aligns well with shorter product development cycles.

Government led innovation initiatives have also reinforced this momentum. Programmes led by the Indian Council of Medical Research (ICMR) including the Medical Innovation Platform, Translational Health Science and Technology initiatives, and support for indigenous diagnostics and medical device validation have strengthened clinical evaluation and real world deployment linkages. The Department of Pharmaceuticals (DoP) has supported downstream translation through schemes focused on medical device development, clinical validation, and manufacturing scale up under its broader pharmaceuticals and medtech policy framework. Similarly, the Department of Biotechnology (DBT), through institutions such as BIRAC, has expanded early and mid stage translational support via programmes such as the Biotechnology Ignition Grant (BIG), National Biopharma Mission, and BioNEST incubators, which explicitly target proof of concept development, regulatory readiness, and industry collaboration.

Targeted schemes aimed at strengthening the pharmaceutical, biotechnology, and medical technology sectors, coupled with incentives for domestic manufacturing and innovation, have lowered entry barriers and fostered indigenous innovation in India. Flagship initiatives under the Atmanirbhar Bharat framework have played a catalytic role by emphasizing self-reliance in healthcare technologies, domestic value creation and quality patent filings. Together, these policies have not only stimulated patenting activity but have also improved the quality, readiness, and translational orientation of biomedical inventions, strengthening the linkage between research, protection, and potential commercialization. The convergence of regulatory reform, digital transformation of Indian Patent Office, and innovation-focused government incentives have therefore emerged as key structural drivers underpinning the sustained rise in India's biomedical innovation output.

Key Insights

**Biomedical patent filings and grants in India (2016–2025) show consistent growth** across therapeutics, medical devices, diagnostics, and vaccines, with a clear acceleration after 2020.

Among the four segments, **therapeutics and medical devices account for the largest share** of overall patenting activity, indicating their central role in the innovation landscape.

**Therapeutics exhibit the sharpest surge in patent applications** reflecting sustained efforts in drug development, repurposing, and biologics.

**Medical devices follow closely, suggesting heightened innovation** in areas such as diagnostics equipment, digital health technologies, and point-of-care solutions.

**Diagnostics and vaccines, while smaller in volume, show growth pattern** that aligns with emerging public health priorities and preparedness for infectious disease outbreaks.

Chapter

05

# Mapping India's Disease Burden against Biomedical Patents

# 5 Mapping India's Disease Burden against Biomedical Patents

**DALYs measure the total burden of disease – both from years of life lost due to premature death and years lived with a disability.**

**1** DALY **=** **1** lost year of healthy life

Disability-Adjusted Life Years (DALYs) is used as the primary metric to quantify the burden of disease. DALYs provide a standardized measure that captures the combined impact of premature mortality and disability, where one DALY represents the loss of one healthy year of life. This metric is calculated as the sum of Years of Life Lost (YLLs) due to premature mortality and Years Lived with Disability (YLDs). In this analysis, DALYs are mapped against granted biomedical patents across communicable diseases (CDs), non-communicable diseases (NCDs), and maternal, neonatal, and nutritional deficiency disorders.

India's persistent disease burden presents a critical paradox - high unmet clinical need coexisting with protected yet under-utilized biomedical invention. The burden of disease within the scope of this study covering CDs, NCDs, and maternal, neonatal, and nutritional deficiency disorders is substantial when measured through DALYs.

Within the disease areas included in this report, NCDs account for majority of the burden, contributing approximately 21.2 crore DALYs, reflecting the long-term impact of Cardiovascular disease & Stroke, Diabetes, Cancer, and Chronic respiratory disorders. CDs contribute approximately 2.22 crore DALYs, underscoring the continued public-health relevance of infections such as Tuberculosis, HIV/AIDS, Malaria, and Dengue. In addition, Maternal, Neonatal diseases, and Nutritional deficiency disorders contribute approximately 5.4 crore DALYs, representing a concentrated but highly consequential burden affecting maternal, neonatal and nutritional outcomes. Together, these figures highlight the magnitude and diversity of the public health challenges faced by the nation.

A detailed analysis of granted patents indicates the availability of mature, legally protected innovations, suggesting that the underlying inventions have met technical and inventive thresholds. However, when analysed alongside their working or commercialization status, a noticeable gap appears within the innovation pathway. In several high-DALY disease areas, patents remain unworked or only partially worked, implying that some technologies have not yet progressed to market ready solutions. Likewise, diseases with substantial DALY burden often show comparatively low patenting activity, suggesting that R&D efforts may not be fully aligned with population-level health priorities. To address these gaps, Government of India has introduced several schemes designed to strengthen regulatory navigation, clinical validation capacity, and translational readiness.

The ICMR MedTech Mitra programme (launched in 2023) provides structured regulatory guidance and connects innovators with clinicians and regulators for early-stage validation. The ICMR MedTech Small Grant Scheme (2022) supports prototyping and preliminary safety testing. The Department of Pharmaceuticals (DoP) introduced the Production Linked Incentive (PLI) Scheme for Medical Devices (2021) and the Pharmaceutical Technology Upgradation Assistance Scheme – PTUAS (2023) to support domestic manufacturing and technology advancement. Biotechnology Industry Research Assistance Council (BIRAC) of Department of Biotechnology operates a suite of innovation-support programmes: the Biotechnology Ignition Grant (BIG, initiated in 2012) for early-stage ideation; SEED and SIIP schemes (2015 onwards) for startup incubation and regulatory mentoring; Clinical Trial Networks and Clinical Validation Support Programme (2021) to bridge gaps in evidence generation; and the establishment of Medical Device Testing and Evaluation Centres (MDTECs, launched in 2020) to provide standardized testing infrastructure.

Collectively, these programmes aim to address regulatory, validation, and translational barriers that often impede promising innovations reaching the market. Given that the research-to-market cycle for biomedical technologies typically spans 10-12 years, the full impact of these government initiatives is expected to become more evident in the coming years as supported technologies mature, complete clinical validation, and advance toward deployment.

## 5.1 Bridging the gap: Disease burden, patents, and missed innovation opportunities

The comparison between disease burden, measured through Disability-Adjusted Life Years (DALYs), and the distribution of granted biomedical patents reveals critical insights into how effectively innovation aligns with public health needs in India. As mentioned earlier the disease burden for NCDs covered in this report is 21.2 crore DALYs, followed by CDs at 2.22 crore DALYs and Maternal, Neonatal and Nutritional disorders at 5.4 crore DALYs. These numbers underscore where innovation is most urgently required to reduce long-term health and economic losses.

When juxtaposed with this burden, granted patents serve as a proxy for mature, legally protected innovation, indicating readiness for translation into products, services, or technologies. However, the distribution of granted patents does not consistently mirror the disease burden (reflected in DALYs). Several high-burden disease areas exhibit either limited patenting activity or a substantial number of granted but unworked patents, which points to a disconnect between invention, protection, and deployment. This misalignment is particularly consequential in diseases where early diagnosis, continuous monitoring, or preventive interventions could significantly reduce DALYs.

The added dimension of patent working and commercialization status further sharpens this analysis. Granted patents that are not worked - meaning they are neither commercialized, licensed, nor deployed - represent an unrealized innovation value. In high-DALY diseases, such non-working patents translate directly into lost opportunities for patient benefit, as technologies that could alleviate disease burden fail to reach health systems. This gap is often driven not by a lack of scientific capability, but by downstream barriers such as limited translational funding, regulatory complexity, procurement challenges, and weak technology-transfer ecosystems.

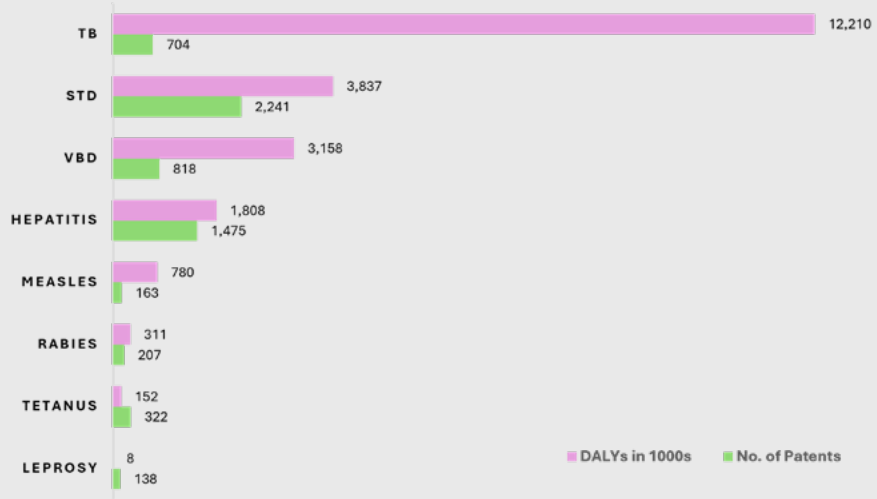
At the same time, the analysis also highlights innovation opportunities. Disease areas where DALYs are high but patent numbers are low signal white spaces for future R&D investment, particularly in diagnostics, medical devices, and preventive technologies that can be deployed at scale. Conversely, disease domains with existing granted but under-exploited patents represent avenues for technology transfer, licensing, or public-private partnerships, enabling faster movement from research to market without restarting the innovation cycle.

Viewed together, the DALY-patent-commercialization framework provides a powerful decision-making tool. It helps identify where innovation is lacking, where it exists but is stalled, and where targeted interventions could yield the greatest health impact. Bridging the gap between disease burden and patient access requires not only generating more patents but ensuring that granted patents are actively worked in alignment with public-health priorities. Unlocking this latent innovation potential is essential to translate intellectual property into reduced DALYs and meaningful improvements in patient care.

## 5.1.1 Communicable diseases

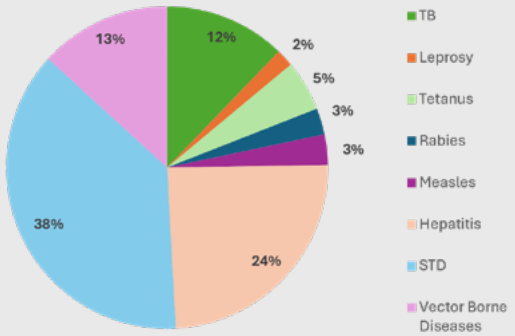
India continues to carry a substantial burden of communicable diseases (measured through DALYs). Within the scope of communicable diseases covered in this report, Tuberculosis (TB) remains the single largest contributor, accounting for approximately 1.22 crore DALYs, reflecting its persistent impact on population health despite long-standing control efforts. Sexually transmitted diseases (STDs) contribute approximately 0.38 crore DALYs, while Vector-borne diseases (VBD) collectively account for approximately 0.32 crore DALYs (underlining the continued public health threat posed by infections transmitted through vectors such as mosquitoes and flies).

***Figure 5.1*** *Comparison of the DALYs vs No. of relevant granted patents in communicable diseases*




Several other communicable diseases contribute smaller but still significant DALY burdens. Hepatitis accounts for approximately 0.18 crore DALYs, driven largely by chronic liver disease and long-term complications. Measles (DALYs of 0.08 Cr), Rabies (DALYs of 0.03 Cr), Tetanus (DALYs of 0.02 Cr) continue to cause preventable health losses, particularly among vulnerable populations. Leprosy, while contributing a comparatively low DALY burden (DALYs of 0.001 Cr), remains a concern due to its disabling consequences and social stigma.

***Figure 5.2*** *Distribution of patents across CDs*




These high and moderate DALY burden diseases are addressed through multiple national health programs under India's public health framework. Tuberculosis is addressed through the National Tuberculosis Elimination Programme (NTEP), while Leprosy is addressed through the National Leprosy Eradication Programme (NLEP). Vector-borne diseases such as Malaria, Dengue, Chikungunya, Japanese encephalitis, Filariasis, and Leishmaniasis are managed under the National Vector Borner Disease Control Program (NVBDCP). Diseases such as Measles, Tetanus, Polio, Hepatitis, and Influenza are integrated within the Universal Immunization Programme (UIP), supported by surveillance under the Integrated Disease Surveillance Programme (IDSP). Rabies prevention aligns with national guidelines under zoonotic disease control frameworks. Sexually transmitted diseases, including HIV, HPV, Syphilis, Bacterial vaginosis, Chlamydia, Gonorrhea, and Trichomoniasis, are addressed through the National AIDS Control Programme (NACP) and

the National STI/RTI Control Strategy. Despite the existence of these programmes, the DALY data indicate that communicable diseases especially TB, STDs, and VBDs continue to exert a heavy toll on the population. This highlights the need for stronger innovation in diagnostics, disease surveillance, treatment adherence technologies, and preventive tools to complement programmatic interventions and accelerate reductions in disease burden at the population level. The comparison between disease burden, measured through DALYs, and the number of granted patents reveals notable mismatches between the public health need and innovation output in terms of lower number of granted patents in this domain.

For example, Tuberculosis (TB) demonstrates the highest DALY burden, yet the corresponding patent activity is comparatively moderate, indicating that innovation intensity does not proportionately match the health care needs. Conversely, Sexually transmitted diseases (STDs) and Hepatitis show relatively lower DALY burden than TB but attract a much higher share of patents. This suggests that innovation and patenting activity are driven not only by disease burden but also by market potential, technology readiness, and commercial feasibility.

Diseases such as Measles, Tetanus and Rabies, while still contributing to DALYs, have fewer patents likely reflecting availability of effective vaccination programs, global eradication efforts, and reduced incentives for incremental innovation.

Leprosy, despite lower DALY contribution, show disproportionately higher patent counts, likely driven by ongoing diagnostic, surveillance, and therapeutic refinement. Overall, the comparison highlights a partial misalignment between disease burden and patenting trends.

Overall, patent distribution appears to be more closely linked to commercial viability and treatment demand than to disease burden per se, highlighting a gap between public health needs and innovation investment, particularly where the development of interventions for managing such diseases is associated with limited markets and constrained commercial viability.

Tuberculosis, Sexually Transmitted Diseases (STDs), and Vector-Borne Diseases (VBDs) contribute to the highest burden of disease in India according to Institute for Health Metrics and Evaluation, Global Burden of Disease (2023), the subsequent analysis shows the distribution of relevant patent filings for these three diseases across key innovation domains i.e. diagnostics, medical devices, vaccines, and therapeutics.

## Tuberculosis

The patent landscape of Tuberculosis indicates a strong dominance of therapeutics, which account for 50% of total filings, highlighting a clear emphasis on treatment-oriented innovation. Medical devices (22%) and diagnostics (20%) together represent a substantial share. In contrast vaccines account for only 7% of patent activity.

***Figure 5.3:*** *Distribution of TB patents across bio-medical categories*

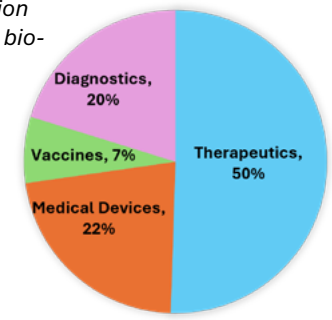
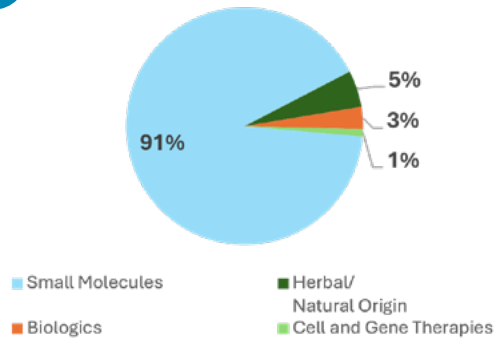
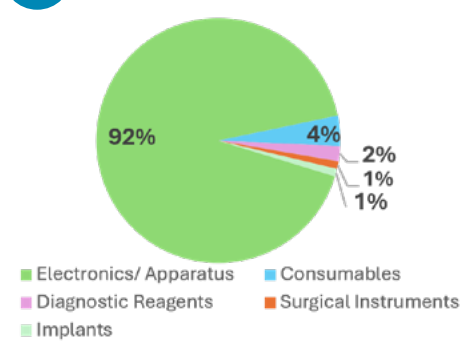



***Figure 5.4*** *Distribution of Tuberculosis patents across biomedical sub-domains*

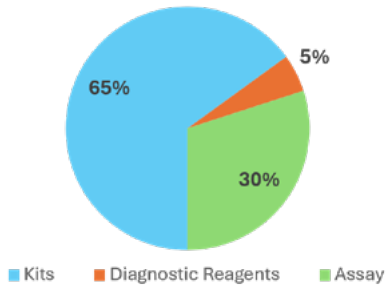
**1 Therapeutics**



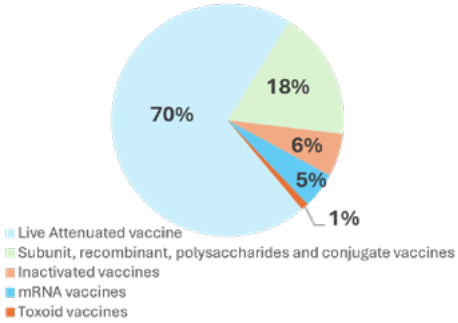

**2 Medical devices**



## 3 Diagnostics




## 4 Vaccines




The patent landscape of Tuberculosis indicates a strong dominance of therapeutics, which account for 50% of total filings, highlighting a clear emphasis on treatment-oriented innovation. Medical devices (22%) and diagnostics (20%) together represent a substantial share. In contrast vaccines account for only 7% of patent activity.

To enhance the granularity and comprehensiveness of the analysis, patents categorized under therapeutics are further disaggregated by therapeutic modality. These sub-categories include cell and gene therapies, small-molecule therapeutics, biologics, and herbal or natural product-based therapies. This provides a nuanced evaluation of innovation trends and research emphasis across different technological approaches.

Within the therapeutics domain, small-molecule compounds account for a dominant 91% share of patents, largely focused on antimicrobial therapies. Key patent holders in this space include GlaxoSmithKline Intellectual Property Development and AbbVie, while among research organisations, CSIR is a key contributor.

In the diagnostics category, test kits constitute approximately 65% share of patents, with innovation strongly oriented toward biomarker-based panels for rapid tuberculosis detection. Rather than large patent portfolios, contributors in this space hold highly targeted, disease specific patents. M/s. Paxgenbio stands out among company-level patent holders, while ICMR, CSIR, and the Indian Institute of Science are key contributors among research organizations through select, high-impact diagnostic kit patents.

The medical device domain is dominated by electronics-based innovations, with patents primarily focused on imaging devices and associated technologies. A substantial share of inventions relates to the processing and analysis of electronic medical data derived from lung imaging, particularly for pulmonary conditions such as Tuberculosis. These include deep-learning and artificial-intelligence algorithms designed for automated recognition, detection, and localisation of clinical features and abnormalities in imaging datasets. M/s. Qure.ai and Philips are key industry players, while Indian Space Research Organisation (ISRO) and the Institute of Plasma Research are key contributors among research organizations.

In the vaccine domain, live attenuated vaccines account for a dominant 70% share followed by and subunit, recombinant, conjugated, or polysaccharide based vaccines. Despite this concentration, the overall innovation pipeline and IP protection remain limited, indicating subdued development activity in this space. Serum Institute of India and GlaxoSmithKline are the principal patent holders, underscoring the need for renewed innovation focus in TB vaccine development.

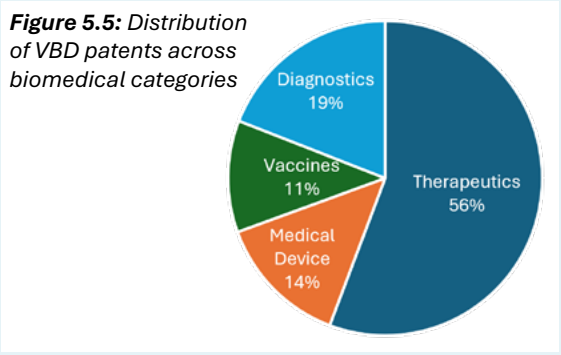
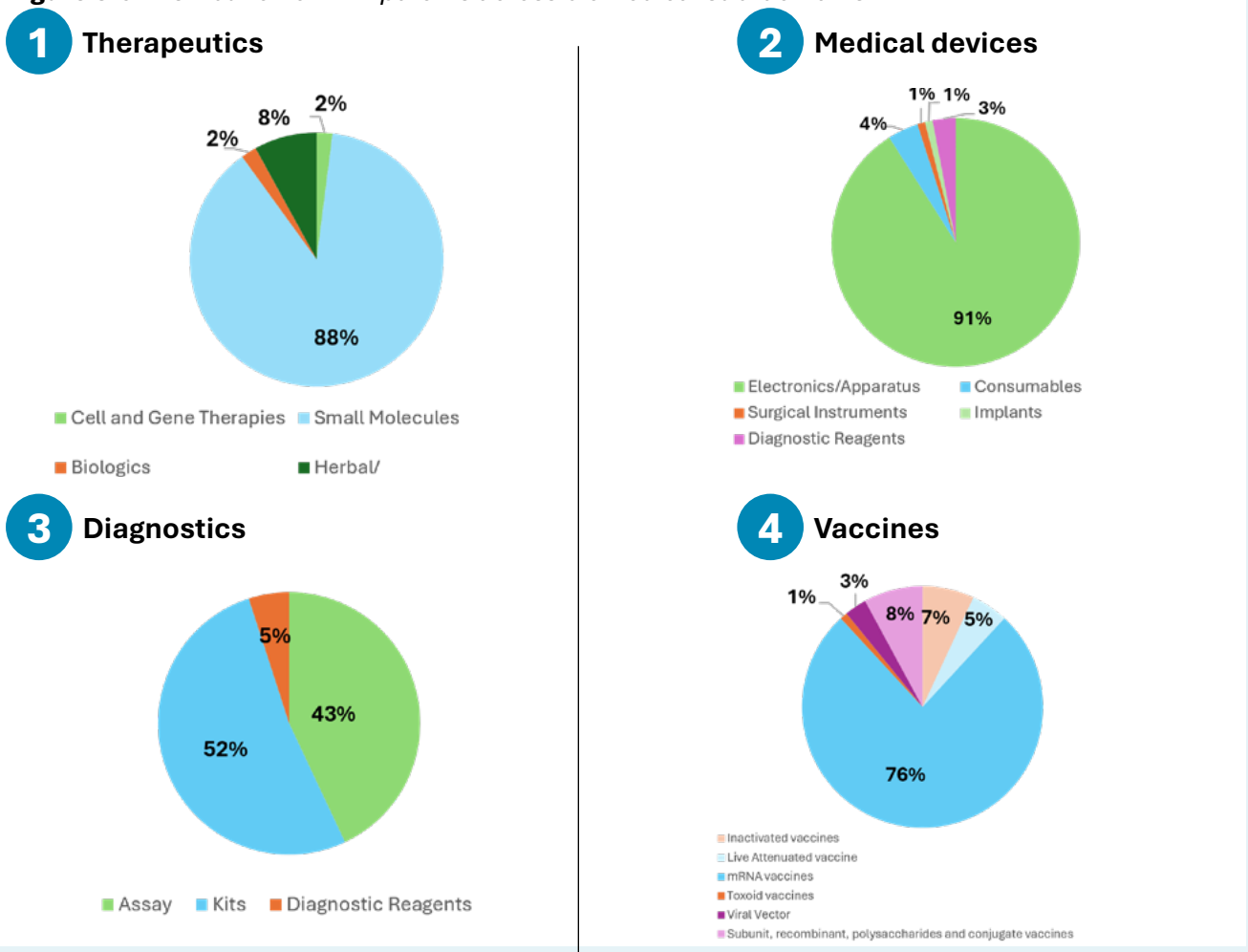



***Figure 5.5:*** *Distribution of VBD patents across biomedical categories*

## Vector borne diseases

The Vector borne diseases in the study include Malaria, Dengue, Chikungunya, Japanese Encephalitis, Filariasis, and Leishmaniasis. The patent landscape of VBD indicates a strong dominance of therapeutics, which account for 56% share, followed by medical devices (14%) and diagnostics (19%) while vaccines account for only 11% of patent activity. The patent distribution of VBD highlights a strong reliance on established and conventional innovation pathways across all categories.

***Figure 5.6*** *Distribution of VBD patents across biomedical sub-domains*




The patent landscape of VBD indicates a strong dominance of therapeutics, which account for 56% of total filings, highlighting a clear emphasis on treatment-oriented innovation. Medical devices (14%) and diagnostics (19%) together represent a substantial share. Vaccines account for only 11% of patent activity.

Within the therapeutics category, small-molecule drugs dominate the patent landscape, accounting for approximately 88% of patents, highlighting continued dependence on conventional pharmacological strategies. In contrast, innovation remains highly limited in biologics, herbal therapies, and advanced cell or gene-based treatments. Novartis and Janssen Pharmaceuticals emerge as key industry contributors, while the US Department of Health & Human Services, Katholieke Universiteit Leuven, and CSIR (Council of Scientific & Industrial Research) represent major contributors from the public and academic research sectors.

In the diagnostics domain, patent activity is largely centred on kits (52%) and assays (43%), underscoring a clear emphasis on practical, scalable, and field-deployable detection solutions for VBD. Diagnostic reagents constitute a very small share (5%). Key industry contributors include M/s. CureVac, Hemex Health, and Fuso Pharma, while significant contributions from the research and academic ecosystem are led by Hokkaido University and ICMR, reflecting strong

public-sector involvement in diagnostic innovation.

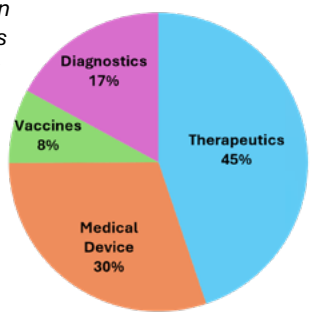
The medical device domain is overwhelmingly dominated by electronics and apparatus-based inventions (91%), indicating that device-level innovation for VBD is predominantly instrumentation-driven. Patent activity is concentrated around diagnostic and analytical equipment, with relatively limited contribution from consumables, surgical instruments, or implantable technologies. Major industry contributors in this domain include Biocad, BSN Medical, Hemex Health, and Sysmex, while CSIR and ICMR provide notable contributors among the research organizations.

In the vaccine domain, the largest share of patents is led by mRNA vaccines (76%), reflecting recent global momentum in RNA technologies. Live attenuated, subunit, recombinant, conjugated, or polysaccharide based approaches contribute a smaller share in the patents. Despite this distribution, overall innovation intensity and IP protection remain limited, pointing to moderate and uneven development activity in VBD vaccines. Key industry patent holders include Gilead Sciences, Inovio Pharmaceuticals, Serum Institute of India Pvt. Ltd., and Hangzhou DAC Biotech, with contributions from research institutions such as Memorial Sloan Kettering Cancer Center.

Overall, the patent landscape reflects a strong dependence on established technologies across therapeutics, diagnostics, medical devices, and vaccines, with limited penetration of next-generation platforms. This pattern highlights a significant opportunity for diversification and innovation.

## Sexually transmitted diseases

***Figure 5.7:*** *Distribution of STDs patents across biomedical categories*

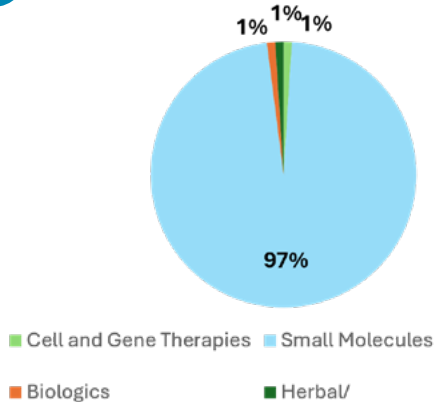



The patent landscape for Sexually transmitted diseases (STDs) [including HIV, HPV, Syphilis, Bacterial vaginosis, Chlamydia, Gonorrhoea, and Trichomonas infections] is characterized by a strong concentration of innovation in therapeutics and medical devices, with relatively smaller but functionally important contributions from diagnostics and vaccines.

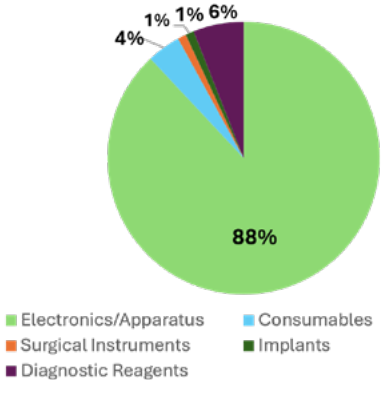
Among STD related patents, therapeutics account for approximately 45% share, followed by medical devices (30%), diagnostics (17%), and vaccines contributing nearly 8%. This distribution underscores the dominant role of treatment-based and device enabled interventions in the STD innovation ecosystem.

***Figure 5.8*** *Distribution of STDs patents across biomedical sub-domains*

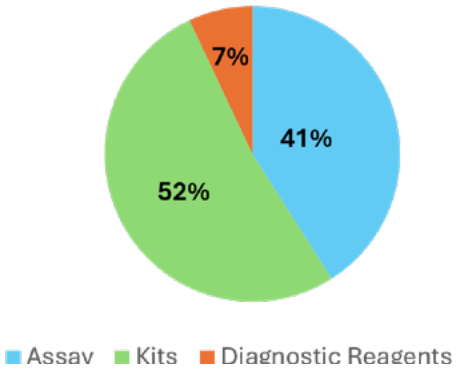
**1 Therapeutics**



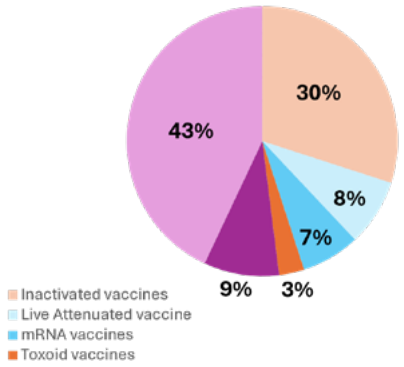

**2 Medical devices**



## 3 Diagnostics




## 4 Vaccines




In the diagnostics domain, kits account for about 52% of diagnostic patents, followed by assays (41%), while diagnostic reagents contribute a much smaller share (7%). This highlights a strong preference for deployable and scalable testing solutions. Among the top five applicants, Gilead Sciences and Regeneron Pharmaceuticals together capture the largest combined share, followed by Memorial Sloan Kettering Cancer Center, Novartis, and Daiichi Sankyo.

The medical device innovation is dominated by electronics-based technologies, accounting for nearly 88% share, with consumables, implants, and surgical instruments contributing to the rest. Among the top five applicants, Huawei holds the largest share, followed by Advanced New Technologies, Fraunhofer, Qualcomm, and Microsoft Technology, collectively representing the bulk of medical device innovation in STDs. This distribution highlights the increasing role of digital platforms, connectivity, and data driven systems in disease management. ICMR, through collaborative filings, accounts for a smaller but targeted share in this domain.

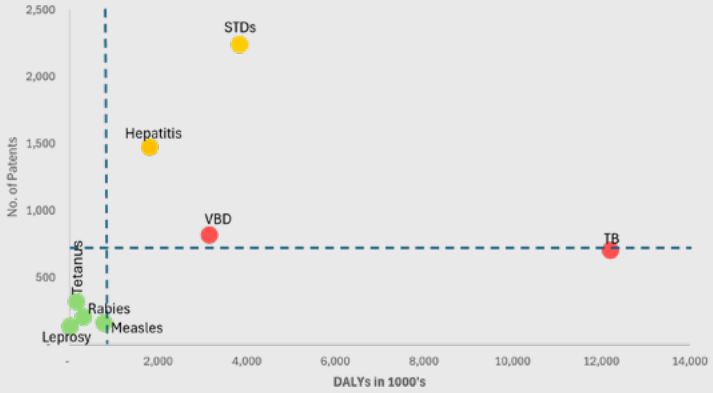
Within the therapeutics domain, small molecule drugs overwhelmingly dominate, accounting for approximately 97% share, indicating continued reliance on conventional pharmacological approaches. Among the top five applicants, the largest share is held by Gilead Sciences, followed by Merck Sharp & Dohme, Novartis, Regeneron Pharmaceuticals, and Pfizer, together accounting for most therapeutic patents. The innovation focus remains concentrated on antiviral and antimicrobial drug development, with minimal diversification into biologics or advanced therapeutic modalities.

In the vaccines domain, subunit, recombinant, polysaccharide, and conjugate vaccine platforms occupy a share of 43%, inactivated vaccines account for about 30% of vaccine patents, followed by viral vector vaccines (9%), live attenuated vaccines (8%), mRNA vaccines (7%), and toxoid vaccines (3%). Among the top five applicants, Gilead Sciences holds the largest share, followed by Hangzhou DAC Biotech, Memorial Sloan Kettering Cancer Center, Serum Institute of India Pvt. Ltd., and Inovio Pharmaceuticals.

Across other communicable diseases such as Leprosy, Tetanus, Rabies, Measles and Hepatitis India's patenting landscape shows a strong concentration in therapeutics, which holds the largest share of granted patents ranging from 41% in Tetanus and 49% in Leprosy to as high as 54% in Hepatitis. Diagnostics and medical devices contribute moderate shares across these diseases, reflecting steady but uneven innovation in detection, monitoring, and supportive technologies. In contrast, vaccines remain the least patented domain, accounting for only 6–23% of patent activity despite being very crucial to elimination and long-term control. When viewed alongside disease burden, several gaps become evident. Tetanus (0.02 crore DALYs), Rabies (0.03 crore DALYs), and Measles (0.08 crore DALYs) continue to pose significant public-health burden yet patenting in next-generation vaccine platforms remain limited highlighting a critical need to strengthen preventive innovation in these diseases. Hepatitis, with a comparatively higher burden (0.18 crore DALYs), shows a patent profile dominated by therapeutics, but relatively low activity in diagnostics and vaccines, signalling opportunities to expand R&D in early detection and prevention. Leprosy, which carries a very low DALY burden (0.001 crore), shows proportionate patenting levels across biomedical domains, aligning with its declining disease burden.

Overall, the analysis reveals that India's innovation landscape across communicable diseases remains treatment-centric, while vaccines and diagnostics which are essential for elimination, surveillance, and reducing future DALY load are under-represented. This imbalance underscores the need for targeted investment in preventive, point-of-care, and early-diagnostic technologies to more effectively address high burden infectious diseases.

***Figure 5.9*** *Comparative assessment of disease burden (DALYs) in CD against the number of relevant granted patents*




**Note**

**Innovation gap High:** High disease burden relative to patent activity

**Innovation gap Medium:** Innovation matches disease burden

**Innovation gap Low:** Low disease burden relative to patent activity

Figure 5.9 above shows a comparative assessment of disease burden (DALYs) against the number of relevant granted patents which reveals innovation gaps. High-burden diseases, particularly Tuberculosis (TB) and Vector-borne diseases (VBDs), are characterised by very high disease burden in terms of DALYs but comparatively limited patenting activity. This divergence highlights a significant gap between public-health need and innovation effort, suggesting systematic underinvestment in biomedical research and patent-supported innovation in diseases that pose significant and persistent health burden.

In contrast, diseases such as STDs and Hepatitis have a moderate disease burden with relatively higher patenting activity, suggesting comparatively stronger innovation incentives or market attractiveness. Low DALY burden diseases including Rabies, Measles, Tetanus, and Leprosy, all of which are concentrated at the lower end in both DALYs and patent counts, reflecting both lower disease burden and limited innovation attention.

Investments in innovation must be realigned with public health needs by prioritizing high-burden diseases like TB and VBDs through targeted R&D incentives, public-private partnerships, and disease burden-linked fund allocation. Systematic use of DALYs in priority setting can help close critical innovation gaps and ensure resources deliver maximum health impact for the population.

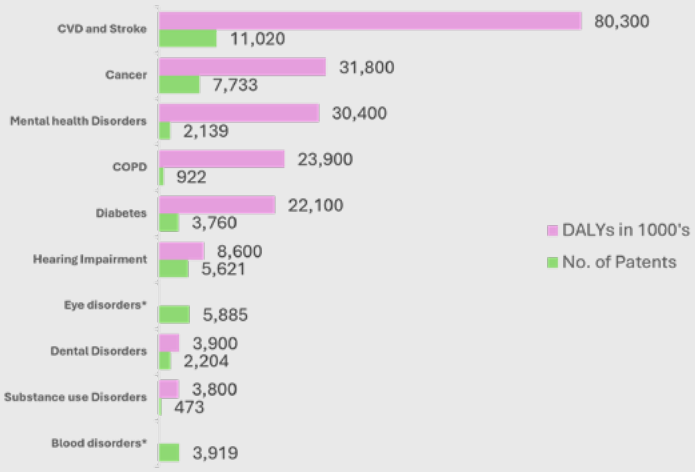
**Key Insights**

- Tuberculosis (TB) has nearly six times higher disease burden than Hepatitis, yet Hepatitis attracts almost double the number of patents. This stark imbalance highlights a significant opportunity to rapidly scale TB-focused innovation, aligning with India's goal of TB elimination by 2030
- Leprosy has very limited device-based patenting, pointing to an opportunity to strengthen rehabilitative and assistive technologies, which are critical for improving long-term patient care, quality of life, and social reintegration.
- Measles shows low levels of patent activity, despite being a national priority under the Zero Measles and Rubella Elimination Programme. This disconnect highlights the need to intensify innovation efforts in diagnostics, disease surveillance, and preventive tools.
- Vector-borne diseases, including Japanese Encephalitis, carry a high disease burden but minimal patenting activity, signalling an opportunity to stimulate technology development across diagnostics, therapeutics, and vector control solutions.
- Across high-priority diseases such as TB and major vector-borne diseases, the combination of high DALYs and lower patenting highlights strong opportunities to enhance innovation and investment aligned with public health needs.

## 5.1.2 Non-communicable diseases

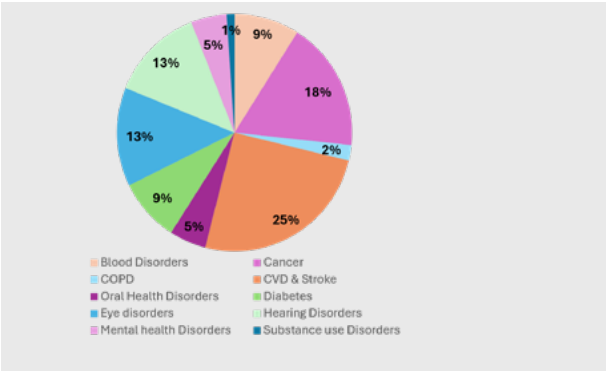
Non-communicable diseases (NCDs) are chronic conditions that tend to be long-lasting and require continuous care. These include Cardiovascular diseases & Stroke, Diabetes, Cancer, Chronic respiratory diseases, and Mental health disorders. In India, NCDs account for most deaths and disability, driven by changing lifestyles, ageing population, and environmental factors. Addressing this burden has become a national priority, reflected in disease-specific public health programs and growing research activity.

***Figure 5.10*** *Comparison of the DALYs vs No. of relevant granted patents in non-communicable diseases*




The DALY burden in India, as shown in Figure 5.10, is dominated by Cardiovascular diseases & Stroke at 8.03 crore DALYs, followed by Cancer (3.18 crore), Mental health disorders (3.04 crore), COPD (2.39 crore), and Diabetes (2.21 crore). These conditions together represent the largest share of healthy life lost due to NCDs. To respond to this, Govt. of India has implemented the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS), which focuses on screening, early diagnosis, and continuity of care. Mental health is addressed through the National Mental Health Programme (NMHP), while Cancer prevention and control are supported through population-based screening and tertiary Cancer centres. The ICMR under the Ministry of Health and Family Welfare contributes through disease specific research networks, national registries, clinical trials, and policy-relevant evidence generation across these high-burden NCDs.

***Figure 5.11*** *Distribution of patents across NCDs*




The distribution of patents highlights where innovation activity is concentrated. Figure 5.11 shows that CVDs & Stroke accounts for about 25% of all NCD related patents, followed by Cancer (18%), Hearing disorders (13%), Eye disorders (13%), Diabetes (9%), Blood disorders (9%), Mental health disorders (5%) and Oral health disorders (5%). These patents reflect advances in pharmaceuticals, diagnostics, medical devices, and digital health solutions. ICMR supported translational research, biomedical innovation enabling flagship schemes such as Medtech Mitra and Medical innovation Patent Mitra, and public-private partnerships have contributed significantly to innovation in Cancer, Mental health, and selected technology driven domains such as Eye care

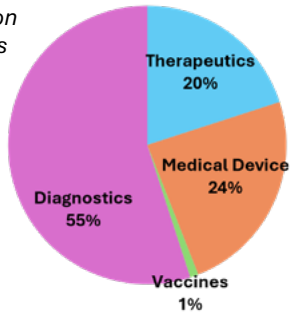
Cardiovascular diseases & Stroke account for the highest DALY burden and exhibit the highest patenting activity among the other NCDs, with 11,020 relevant patents. While the relative higher number of patents indicates sustained innovation efforts, the scale of patents does not appear proportional to the magnitude of the disease burden. High disease burden conditions such as Mental health disorders, COPD, Diabetes appear to represent areas where enhanced research translation, technology development, and innovation investments may be required. In contrast,

Hearing disorders exhibit relatively higher patent activity compared with its disease burden.

Bridging these gaps will require targeted innovation incentives, stronger translational research, and closer alignment between national disease programmes, ICMR research priorities, and industry innovation particularly for Cardiovascular disease & Stroke, Diabetes, and Chronic respiratory conditions where the unmet need remains the highest.

## Cardiovascular Diseases (CVDs) & Stroke

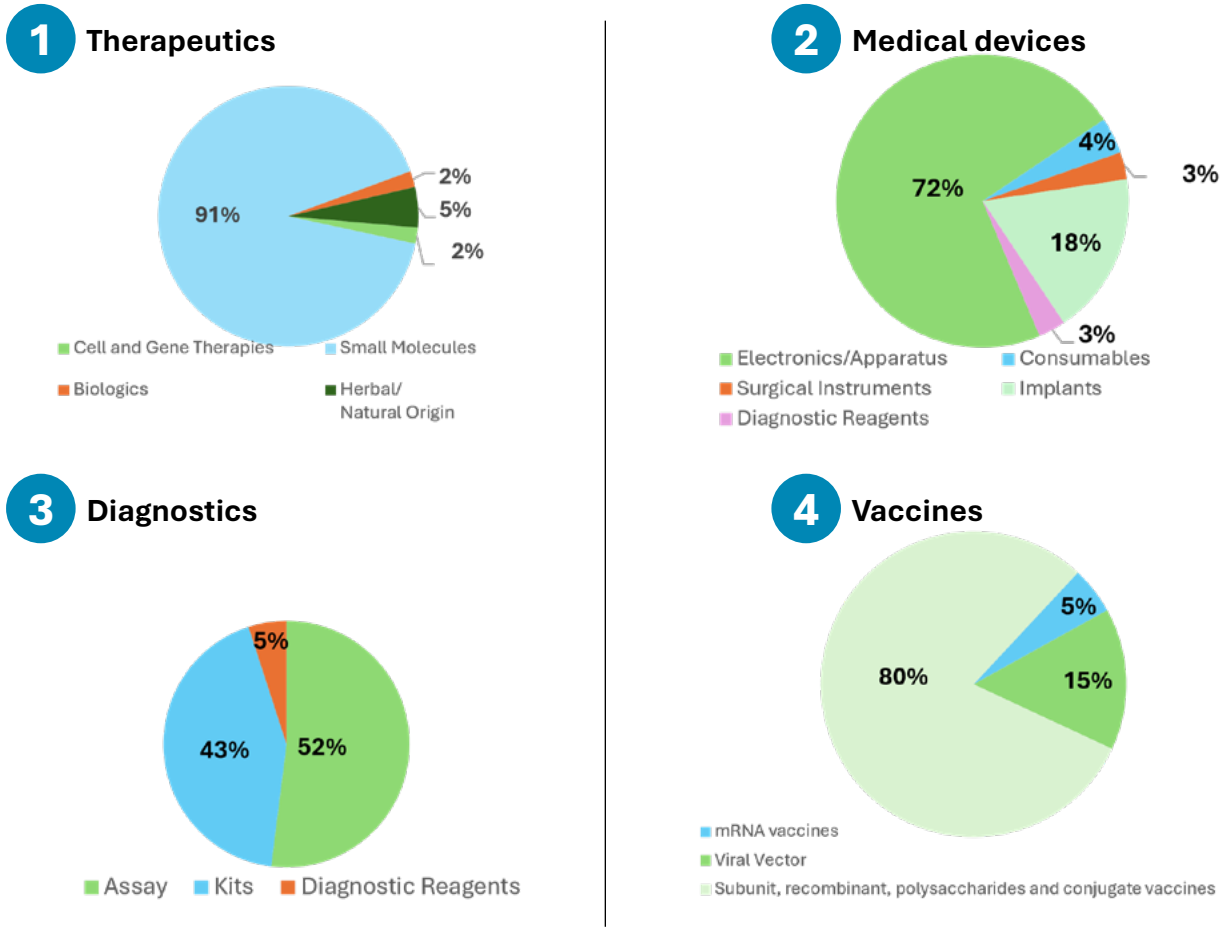
***Figure 5.12:*** *Distribution of patents across CVDs and Stroke*




Cardiovascular diseases represent the highest disease burden in India, with a DALY burden of 8.03 crore. The scale and chronic nature of CVDs ranging from hypertension and ischemic heart disease to stroke make continuous innovation essential. Advances are needed not only in treatment but also in early detection, long-term disease management, and affordable technologies suitable for large populations.

CVDs and stroke related innovations are led primarily by diagnostics (55%), followed by medical devices (24%), therapeutics (20%), and a very small share of vaccines (1%). This distribution reflects the strong emphasis on interventional cardiology, implants, monitoring devices, and drug therapy.

***Figure 5.13*** *Distribution of CVD and Stroke patents across biomedical sub-domains*

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Diagnostics dominate the innovation landscape with 55% of patents, focusing on imaging, biomarkers, and diagnostic platforms for early risk detection and disease monitoring. Key applicants include Novartis, Pfizer, Janssen Pharmaceuticals, Hangzhou DAC Biotech, and Boehringer Ingelheim.

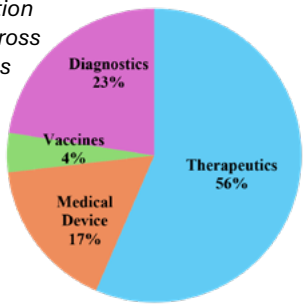
Medical devices represent 24% patent share, driven by technologies such as stents, cardiac implants, imaging systems, monitoring devices, and minimally invasive surgical instruments. Major applicants include Novartis, Pfizer, Hoffmann-La Roche, BSN Medical, and Bristol Myers Squibb.

Therapeutics account for 20% of patent share, focusing on lipid-lowering agents, anticoagulants, antihypertensives, and heart-failure drugs. Leading applicants include Novartis, Janssen Pharmaceuticals, Eli Lilly, Pfizer, and Boehringer Ingelheim, with limited but visible participation from ICMR and Indian academic institutions as co-applicants, highlighting emerging domestic research contributions.

Vaccines against influenza and pneumococcal disease are crucial for reducing cardiovascular risk, acting as a "foundational pillar" alongside standard treatments, according to the European Society of Cardiology (ESC). These vaccines decrease inflammation and prevent infection-related cardiac events. Osaka university and FunPep collaboration have a patent relating to PCSK9 vaccines (cholesterol-lowering). Vaccines account for only 1% of patent share, with limited activity led by Hangzhou DAC Biotech, Pfizer, Arvinas Operations, Novartis, and IIT Bombay.

## Cancer

***Figure 5.14:*** *Distribution of Cancer patents across biomedical categories*

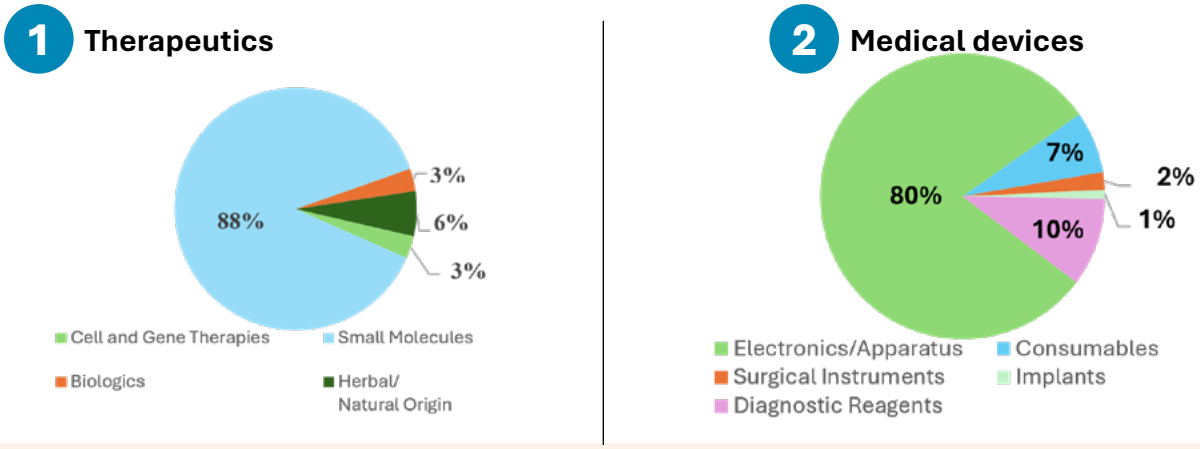


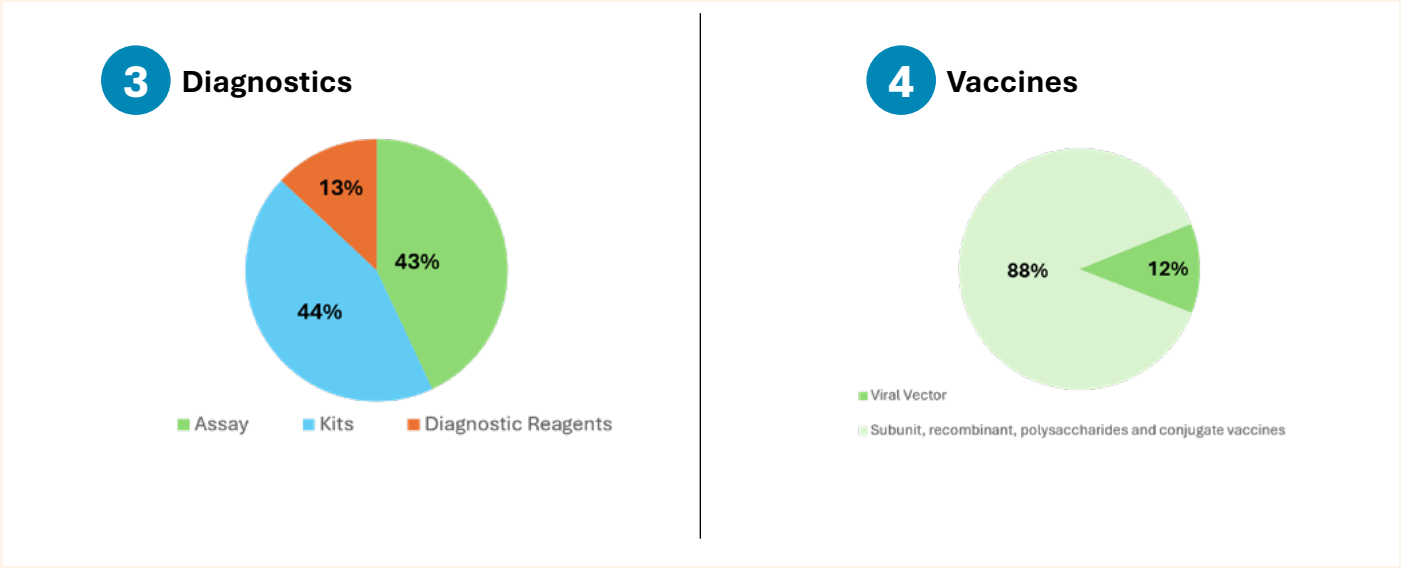

Cancer poses a major health burden in India (DALYs of 3.18 crore) contributed by late diagnosis, rising incidence, and long treatment duration.

Innovation is critical across the care continuum, from early detection to precision treatment and survivorship care, making cancer one of the most research-intensive NCDs globally.

Patent concentration in cancer is skewed heavily towards therapeutics with 56% share, reflecting strong innovation in targeted therapies, biologics, immuno-oncology, and combination treatments. Key applicants include Novartis, Roche, Pfizer, AstraZeneca, and Bristol Myers Squibb.

***Figure 5.15*** *Distribution of Cancer patents across biomedical sub-domains*






Diagnostics comes next with 23% share in patents, with innovations in biomarkers, companion diagnostics, and precision medicine platforms enabling personalised cancer care. Imaging-based and molecular diagnostics are particularly prominent, supporting early detection and treatment stratification. Key applicants include Cytomax, Janseen, Bristol Myers Squibb.

Medical devices with 17% share in patents, play a supporting but essential role, especially in imaging, radiotherapy equipment, robotic surgery, and minimally invasive interventions. Key applicants include Galera Therapeutics, Neoscan Solutions, Ablynx, Nykode Therapeutics, Immatics Biotechnologies GmbH.

Vaccine innovation exists mainly in therapeutic cancer vaccines but remains comparatively limited due to scientific complexity and long development timelines. Kolon Life Science is actively developing KLS-3021, a next-generation oncolytic virus therapy designed to act as a cancer vaccine to treat solid tumours.

## Diabetes

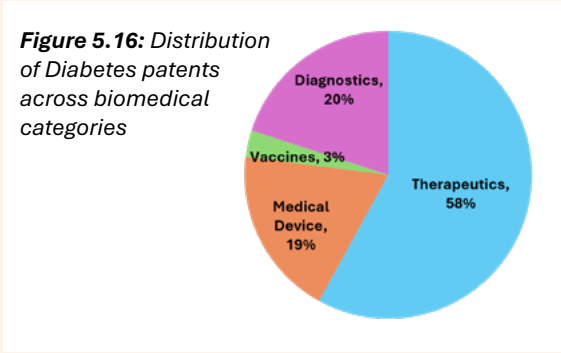



***Figure 5.16:*** *Distribution of Diabetes patents across biomedical categories*

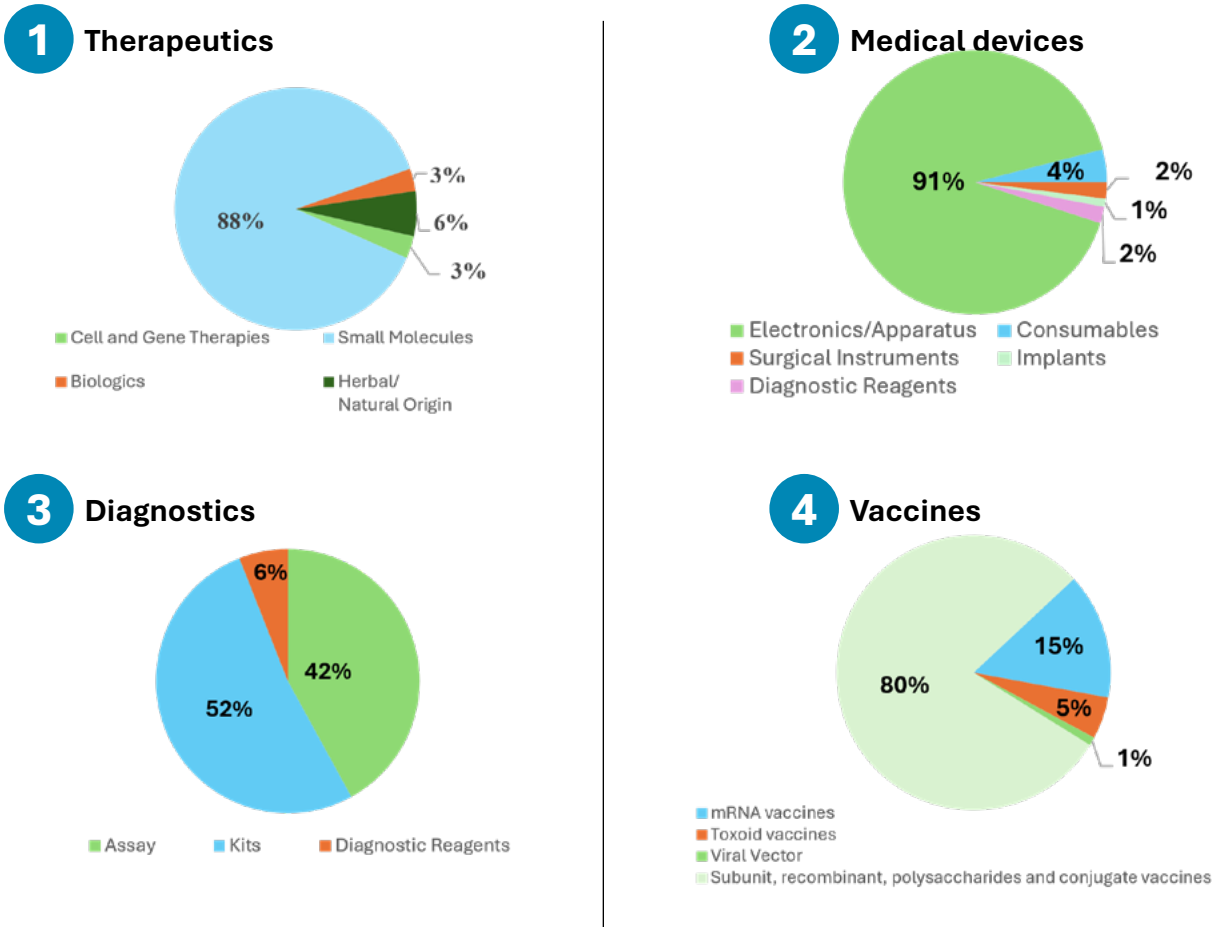
Diabetes presents a rapidly growing public health challenge in India, with a DALY burden of 2.21 crore. Its lifelong management requirements and high complication risk make innovation vital for improving adherence, monitoring, and long-term outcomes.

Diabetes-related patenting is primarily driven by therapeutics and medical devices, reflecting the need for improved insulin formulations, oral antidiabetics, and technologies that support daily disease management. Innovation in diagnostics is also important, especially for early detection and continuous glucose monitoring. Therapeutics focus on insulin analogues, combination therapies, and metabolic pathway modulation, with leading global applicants including Eli Lilly, Novo Nordisk, Pfizer, and Novartis.

Medical devices are a major innovation area, particularly for glucose monitoring systems, insulin delivery devices, and wearable technologies. These inventions address adherence and self-management, which are critical challenges in diabetes care in India.

Diagnostics support screening and risk assessment, with innovations in point-of-care testing and digital health integration. Vaccine-related innovation in diabetes remains minimal, limited to experimental approaches in autoimmune diabetes.

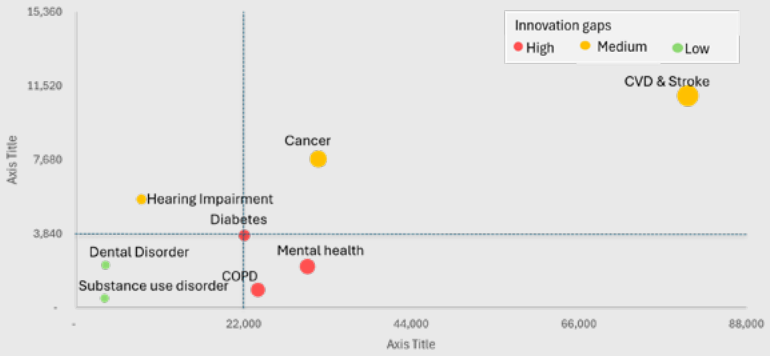
***Figure 5.17*** *Distribution of Diabetes patents across biomedical sub-domains*




Across other non-communicable diseases, India's patenting patterns show strong variation by domain, revealing important gaps relative to disease burden. COPD (2.39 crore DALYs) and Mental health disorders (3.04 crore DALYs) two of the highest-burden conditions are dominated by therapeutic patents (60% and 42%), while diagnostics and devices remain comparatively under-represented, suggesting a need for stronger investments in early detection, monitoring tools, and digital-decision support. Hearing disorders, despite a significant burden (0.86 crore DALYs), shows an overwhelming concentration in medical-device patents (97%) with negligible patent activity in therapeutics, diagnostics, and vaccines, indicating reliance on assistive technologies. Oral-health disorders display moderate DALY burden but relatively strong device-centric patenting (43%), reflecting active innovation in corrective and procedural technologies. Blood disorders, show a balanced spread of patents across therapeutics (44%), devices (28%), and diagnostics (13%), aligning more closely with clinical needs. Substance-use disorders, though carrying substantial societal health impact (0.38 crore DALYs), see their highest patenting in therapeutics (52%) but very limited activity in vaccines and diagnostics, underscoring opportunities for behavioural-health diagnostics, monitoring solutions, and preventive biomedical tools.

Overall, the data reveal a treatment-heavy innovation landscape, with diagnostics, preventive tools, and vaccines consistently under-patented across several high-burden NCDs especially COPD, Mental health disorders, and Hearing disorders highlighting unmet need in early detection, continuous monitoring, and long-term disease modification.

***Figure 5.18*** *Comparative assessment of disease burden (DALYs) in NCD against the number of relevant granted patents*




**Note**

**Innovation gap High:** High disease burden relative to patent activity

**Innovation gap Medium:** Innovation matches disease burden

**Innovation gap Low:** Low disease burden relative to patent activity

Disease conditions such as Mental health disorders, COPD, and Diabetes, despite having substantial DALYs, show comparatively lower patent activity, suggesting innovation gaps. This underscores the need for targeted innovation incentives and public-sector research leadership, especially through agencies such as ICMR, to better align innovation with India's biggest health challenges.

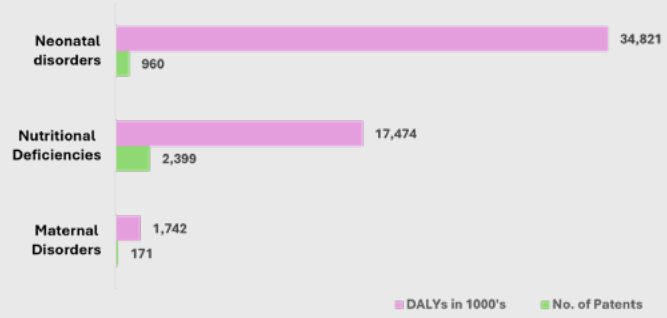
**Key Insights**

- CVD & Stroke, COPD, Mental Health Disorders, and Diabetes show very high disease burden but disproportionately low patenting activity.
- CVD & Stroke: Extremely high DALYs but low patenting activity relative to the disease burden, indicating the need for accelerated innovation in medical devices, and therapeutics.
- COPD: High DALYs but low patenting activity, indicating the need for innovation in respiratory care technologies
- Diabetes: High DALYs but relatively low patent output, indicating the need for innovation in affordable diagnostics, monitoring devices.
- Mental Health Disorders: High DALY load with limited patenting activity, indicating the need for novel tools in detection, management, and digital mental health solutions.

## 5.1.3 Maternal, Neonatal and Nutritional deficiency disorders

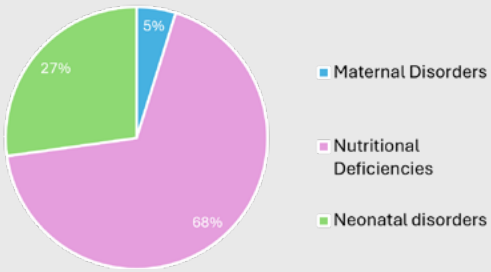
Reproductive, maternal, and newborn health is a cornerstone of India's public health system, encompassing the continuum of care from pregnancy and childbirth through infancy and early childhood. While the country has achieved notable progress over the past decade, these conditions continue to impose a substantial burden on population health, contributing significantly to mortality and long-term disability. This burden is driven primarily by neonatal disorders, maternal complications, and persistent nutritional deficiencies, particularly among vulnerable populations. Innovation in this domain is essential to reduce preventable deaths, improve quality of care, and strengthen health system resilience, especially in resource-limited settings.

***Figure 5.19*** *Comparison of DALYs vs No. of relevant patents for maternal, neonatal and nutritional deficiency disorders*




The DALY burden in India is highest for neonatal disorders, accounting for 3.5 crore DALYs reflecting challenges such as preterm birth, birth asphyxia, and neonatal infections. Nutritional deficiency disorders represent the second largest burden with 1.75 crore DALYs, driven by childhood undernutrition, micronutrient deficiencies, and maternal anaemia. In contrast, maternal disorders account for a lower DALY burden of 0.2 crore, reflecting improvements in maternal care, though persistent regional and inequity-related challenges remain. These conditions are addressed through national programs and schemes such as Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakram (JSSK), POSHAN Abhiyaan, and Mission Indradhanush, while the ICMR contributes through maternal and newborn health research units, national nutrition studies, clinical guidelines, and implementation research to support evidence-based policymaking.

***Figure 5.20*** *Distribution of patents across maternal, neonatal and nutritional deficiency disorders*




The patent distribution across these conditions reveals a strong concentration of innovation in nutritional deficiencies, which account for 68% of all related patents, reflecting emphasis on fortified foods, supplements, formulations, and nutrition-focused interventions. Neonatal disorders account for 27% of patents, indicating active innovation in neonatal care technologies, diagnostics, and interventions, though still disproportionate to the burden.

A clear gap emerges when DALYs are compared with patent shares. Neonatal disorders show the largest mismatch, with the highest DALY burden and very low patenting activity, indicating under-investment in innovation relative to need. Maternal disorders exhibit lower DALY burden

with a very small share of patents, pointing to limited technological and therapeutic innovation. Conversely, Nutritional deficiencies demonstrate alignment between patents and DALY burden, benefiting from sustained programme attention and innovation incentives. Addressing these gaps will require targeted innovation support for neonatal and maternal health, stronger translation of ICMR-led research into scalable technologies, and closer alignment between disease burden, public funding, and the innovation ecosystem.

## Neonatal disorders

Neonatal disorders constitute the highest disease burden within the framework in India, with a DALY burden of 3.5 crore. This segment includes conditions such as preterm birth complications, birth asphyxia, neonatal sepsis, jaundice, and other early-life disorders that significantly affect survival and long-term development. Innovation plays a pivotal role in neonatal health, as timely, effective interventions during the neonatal period can generate lifelong benefits and provide the greatest return on investment in terms of mortality reduction and disability prevention. Therapeutics account for the largest share of innovation and patenting activity in neonatal diseases (48%), followed by diagnostics (25%) and medical devices (21%), while vaccines represent a comparatively small share (6%). This imbalance suggests substantial scope for expanding preventive, diagnostic, and device-based innovations, particularly aligned with public-sector priorities and ICMR-supported translational research, to more effectively address India's neonatal health challenges.

***Figure 5.21:*** *Distribution of neonatal disorder patents across biomedical categories*

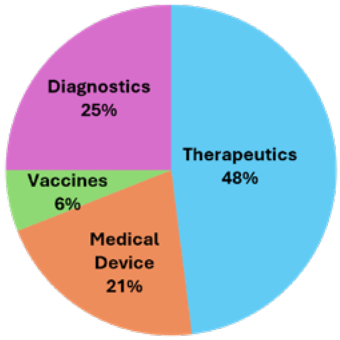
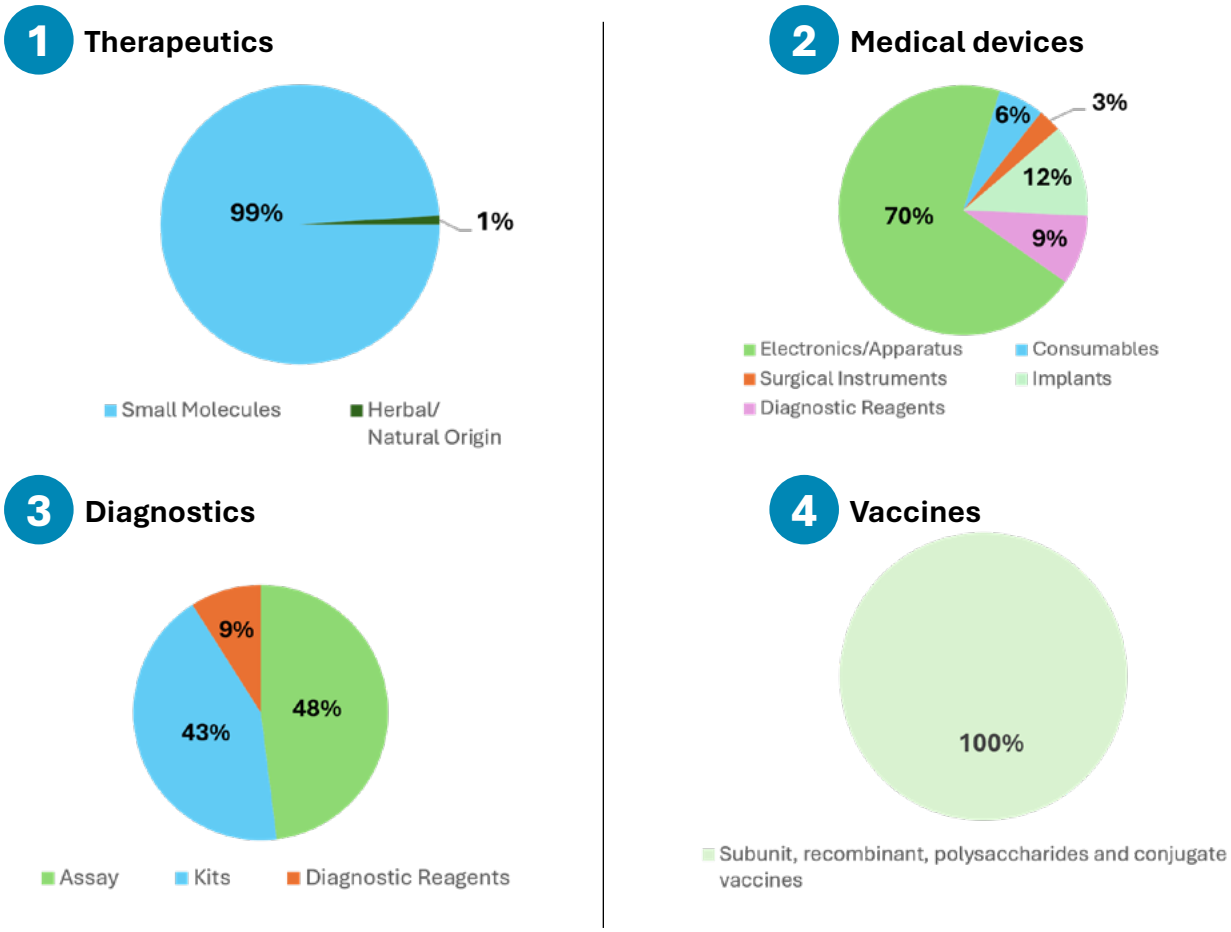



***Figure 5.22*** *Distribution of neonatal disorders patents within biomedical subdomains*



Therapeutics account for the largest share at 48% with treatments focused on neonatal infections, inflammatory conditions, and metabolic or genetic disorders identified at birth. Leading applicants in this category include Pfizer, Incyte, Novartis, Genentech, and AbbVie, indicating strong interest from global pharmaceutical companies. ICMR also appears as an applicant, highlighting its role in advancing context-specific therapeutic research for neonatal care in India.

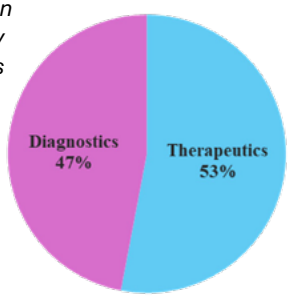
Diagnostics represent 25% of neonatal patents, underlining the importance of early and accurate identification of neonatal conditions such as sepsis, respiratory distress, and metabolic abnormalities. Innovations in this category are aimed at point-of-care detection, biomarker-based screening, and rapid testing platforms suitable for neonatal intensive care settings. Major applicants include Pfizer, Incyte, Arvinas Operations, Novartis, and Albireo.

Medical devices constitute 21% of neonatal patent activity, covering technologies such as neonatal monitoring systems, respiratory support devices, incubators, and supportive care equipment. Key applicants include Albireo, Pfizer, Genentech, Sage Therapeutics, and Regeneron Pharmaceuticals. Despite the heavy reliance on medical devices in neonatal care, patent activity in this area remains lower than in therapeutics, highlighting significant opportunities for innovation in affordable, scalable neonatal technologies.

Vaccines account for only 6% of neonatal patents, making this the least represented subdomain. Key applicants include Pfizer, Arvinas Operations, Institut Pasteur, GlaxoSmithKline Biologicals, and Hangzhou DAC Biotech. Given the significant role of infections in neonatal mortality, the limited vaccine share highlights a clear innovation gap and a potential area for long-term research investment.

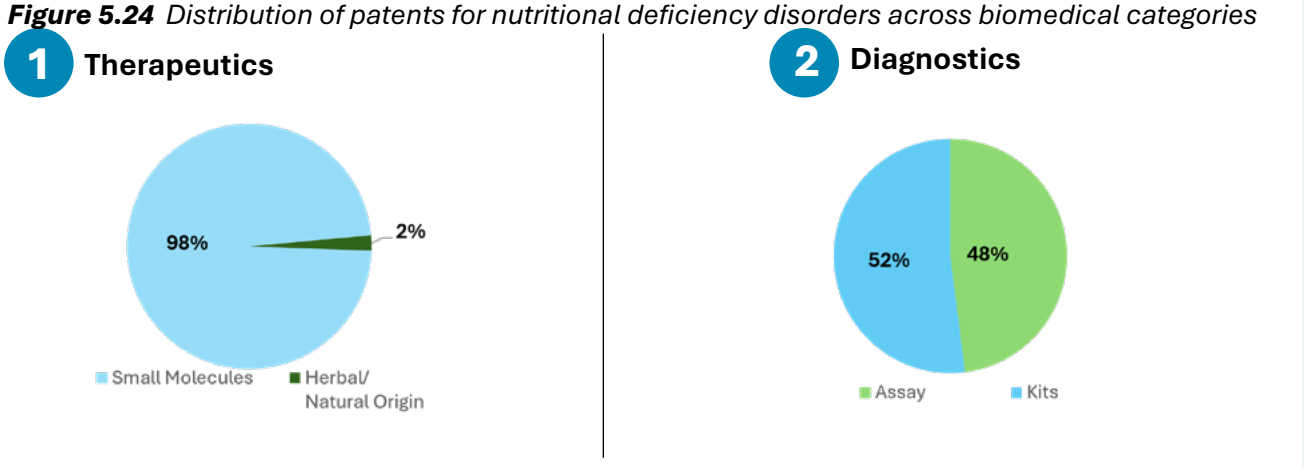
## Nutritional deficiency disorders

***Figure 5.23:*** *Distribution of nutritional deficiency disorder patents across biomedical categories*




Patenting activity in nutritional deficiency disorders is predominantly focused on therapeutics, representing 53% of total patents. Diagnostics account for the remaining 47%. This distribution highlights significant innovation in approaches for the diagnosis, monitoring, and management of nutritional deficiencies.

***Figure 5.24*** *Distribution of patents for nutritional deficiency disorders across biomedical categories*




Innovation in nutritional deficiency disorders in India is focused on therapeutics (53%) and diagnostics (47%). Therapeutic patents are largely centred on small-molecule formulations, while diagnostic innovation is evenly split between assays and diagnostic kits, reflecting advances in both laboratory and point-of-care testing. Companies such as Nestlé, Sanofi, and Albireo are key contributors, demonstrating strong industry commitment to addressing nutrition-related disorders.

## Maternal disorders

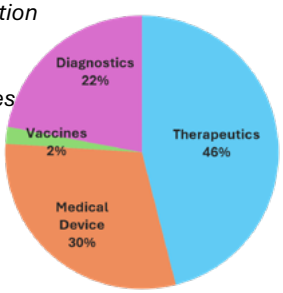
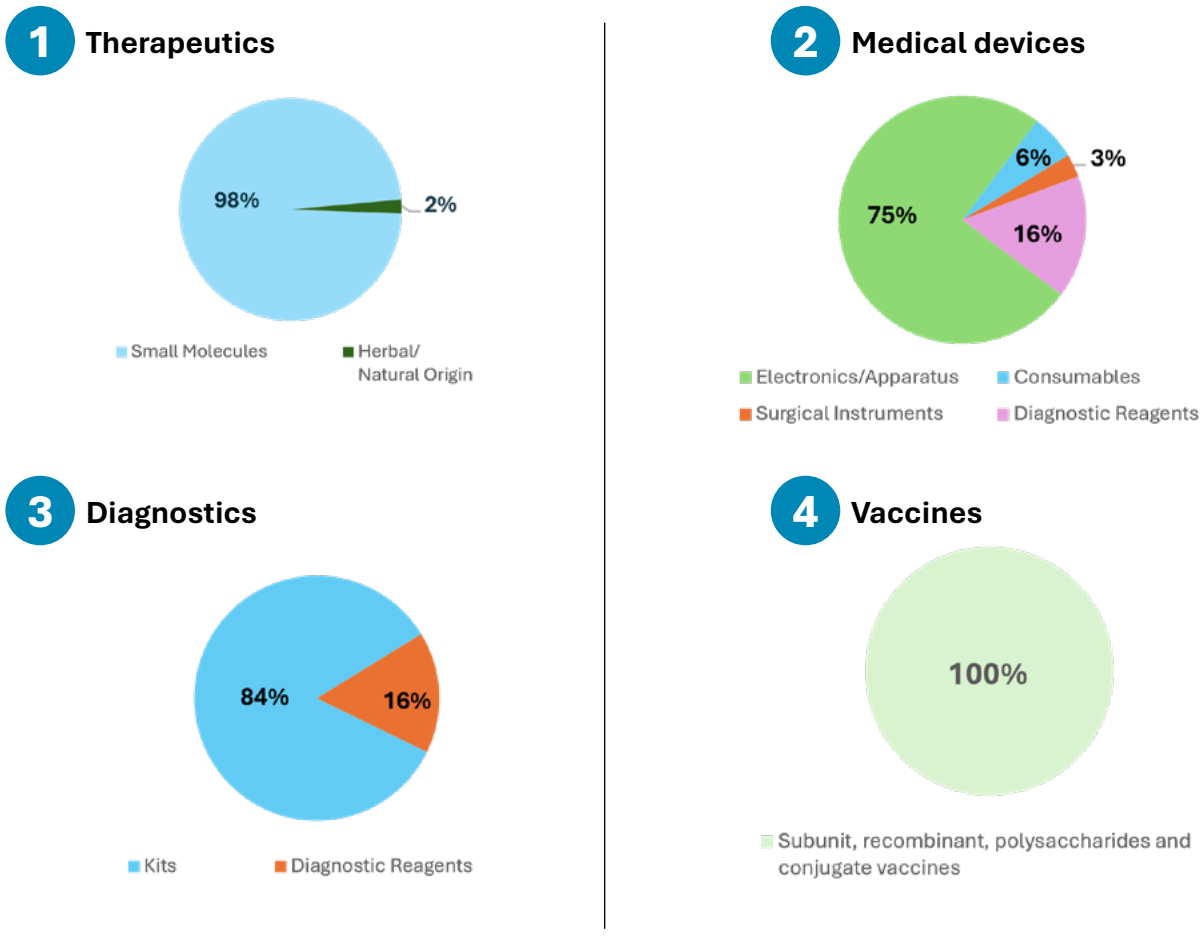



***Figure 5.25:*** *Distribution of maternal disorder patents across biomedical categories*

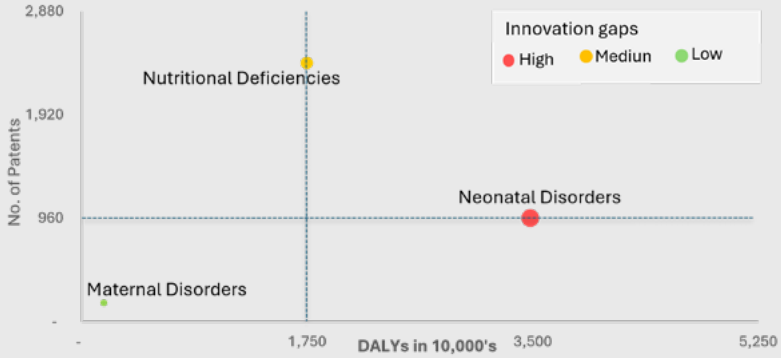
Innovation in maternal disorders in India is led by therapeutics (46% of granted patents), reflecting a strong focus on treatment-oriented solutions. Medical devices account for 30%, demonstrating substantial progress in maternal care and monitoring technologies, while diagnostics contribute 22%, highlighting efforts to enhance early detection and disease management. Vaccines represent a small share (2%), indicating limited but emerging innovation in preventive maternal health interventions.

***Figure 5.26*** *Distribution of maternal disorder patents across biomedical sub-domains*



Innovation in maternal disorders in India is predominantly driven by therapeutics, with small-molecule formulations accounting for 98% of related patents. Diagnostic activity is heavily focused on diagnostic kits (84%), reflecting strong emphasis on screening and early detection. Medical device innovation is led by electronic and apparatus-based technologies (75%), highlighting advances in maternal monitoring and diagnostic support. Vaccine-related patenting remains limited and is confined to subunit, recombinant, polysaccharide, and conjugate vaccine platforms. Key applicants, including AbbVie, Cacio Life Sciences, and Albireo, emerge as important contributors, highlighting active industry engagement in advancing innovative solutions for maternal health.

***Figure 5.27*** *Comparative assessment of disease burden (DALYs) in maternal, neonatal and nutritional deficiency disorders against the number of relevant granted patents.*




**Note**

**Innovation gap High:** High disease burden relative to patent activity

**Innovation gap Medium:** Innovation matches disease burden

**Innovation gap Low:** Low disease burden relative to patent activity

Disease conditions such as Mental health disorders, COPD, and Diabetes, despite having substantial DALYs, show comparatively lower patent activity, suggesting innovation gaps. This underscores the need for targeted innovation incentives and public-sector research leadership, especially through agencies such as ICMR, to better align innovation with India's biggest health challenges.

## 5.1.4 Biomedical innovations and public health impact

During this study, it was observed that leading government institutions and departments such as ICMR, DBT BIRAC, DST, and CSIR have consistently prioritized the public health needs of the country, making available technologies that respond to clear unmet needs rather than being solely driven by patenting considerations. Their foremost mandate is to address the nation's high disease burden and foster the development and commercialization of technologies—including medical countermeasures essential for the containment of communicable diseases during epidemics and pandemics. While patents are recognized as supportive tools to safeguard innovation, they are not placed above public health imperatives. This ensures that technologies can be made available to India's vast population, and globally, at a rapid pace. In times of public health urgency, such as pandemics, the focus remains firmly on rapid access, scale up, and deployment of life saving solutions. The strength of these institutions lies in their research orientation, producing high impact outputs such as research papers, systematic reviews, clinical guidelines, and programmatic evidence that directly shape national health policies and global recommendations. [20]

Few examples of this public health–first approach include:

- Communicable Diseases (CD): COVID Kavach IgG ELISA kit (ICMR), Japanese Encephalitis ELISA kit (ICMR), Measles ELISA kit (ICMR), kits for Hepatitis A & E, and Rotavirus (ICMR)
- Non Communicable Diseases (NCD): Divya Nayan visually impaired reading machine (CSIR)
- Women & Child Health: Rapid diagnostic tests for Haemophilia A & Von Willebrand disease (DBT BIRAC), IV Ferric Carboxy Maltose protocol for anaemia (DBT BIRAC)

Key Insights

Neonatal disorders represent one of the most significant unmet needs in healthcare innovation, bearing a disproportionately high DALY burden but strikingly low patent activity. This disparity highlights a substantial underinvestment in translational research and scalable solutions, particularly in a period of life where effective interventions can deliver the greatest returns across the lifespan.

In contrast, the patent activity of nutritional disorders is broadly commensurate with its disease burden, reflecting a relatively mature and responsive innovation ecosystem in this area.

Maternal disorders, meanwhile, are characterized by relatively lower disease burden and limited patenting, suggesting a comparatively lower prioritization within R&D pipelines.

## 5.2 Working of patents

In a country such as India, which faces a high burden of communicable and non-communicable diseases, compulsory licensing plays a vital role where patented biomedical innovations are not adequately commercialized, made affordable, or accessible to the population.

Form 27 under the Indian Patents Act, 1970 is a statutory mechanism used by the Indian Patent Office (IPO) to assess the "Working of a patent" in India. Under Section 146 (2) read with Rule 131, every patentee and licensee of such patent is required to periodically file Form 27 declaring whether the patented invention has been worked in India, the extent of such working (commercial scale), and reasons for non working, if applicable. The burden (onus) lies squarely on the patentee or licensee to voluntarily disclose this information. Patents are not regarded merely as exclusionary rights. The Act envisages that patented inventions should be worked in India on a commercial scale and made available to the public at reasonably affordable prices, reflecting the public-interest orientation of India's patent regime.

Comparable "Working requirement" provisions exist internationally, though they vary significantly in strength and enforcement. Countries such as India, Brazil, Thailand, China, Indonesia, and several Latin American jurisdictions have statutory obligations linking patent rights to local working or public availability, particularly for pharmaceuticals and critical technologies. In contrast, the United States and most European jurisdictions do not impose routine working disclosure obligations; patents there can be enforced even if not worked domestically, subject to antitrust or competition law limits. However, many countries retain working requirements indirectly, through the availability of compulsory licensing, which functions as a remedy against patent non-use or inadequate supply rather than an automatic forfeiture mechanism.

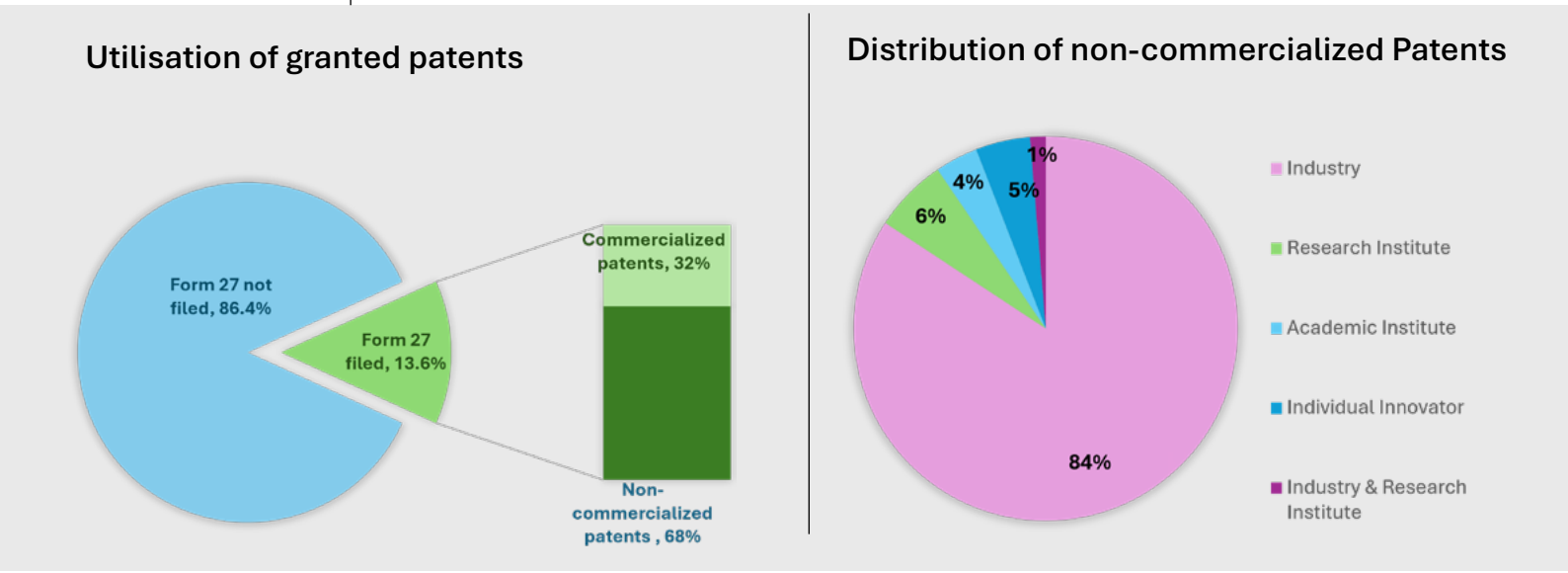
In terms of enforcement and penalties, Form 27 compliance in India has historically been weakly enforced, though it has gained renewed scrutiny in recent years. Failure to file Form 27, filing false information, or deliberate non-disclosure can attract penalties under Section 122 of the Patents Act, which includes monetary fines (currently up to ₹10 lakh) and, in extreme cases involving wilful misrepresentation, potential criminal liability. That said, patents are not automatically revoked for non-working or non-filing. Instead, inaccurate or missing Form 27 disclosures can severely weaken the patentee's position in litigation, opposition proceedings, and most critically the compulsory licensing applications.

The working of patent requirement is closely tied to compulsory licensing (CL) under Section 84 of the Patents Act. A compulsory license may be granted if, after three years from grant, (i) the reasonable requirements of the public are not met, (ii) the patented invention is not available at an affordable price, or (iii) the invention is not worked in India. Form 27 is often the primary evidentiary document used by courts and the IPO (Indian Patent Office) to assess these factors. Thus, the disclosure regime is not punitive by default; rather, it serves as a transparency and accountability tool, ensuring patents fulfil their economic and social bargain exclusive rights in exchange for real-world public benefit.

## 5.2.1 Communicable diseases

The landscape of patent utilization in the domain of communicable diseases reveals a striking gap between innovation and commercialization. According to Form 27 data submitted to the Indian Patent Office, only 13% of applicants/licensees have declared the working of their patents. Of these, 32% represent patents that have been commercialized, while 68% remain non commercialized.

***Figure 5.28*** *Commercialization status as per Form 27 for granted patents in CDs*

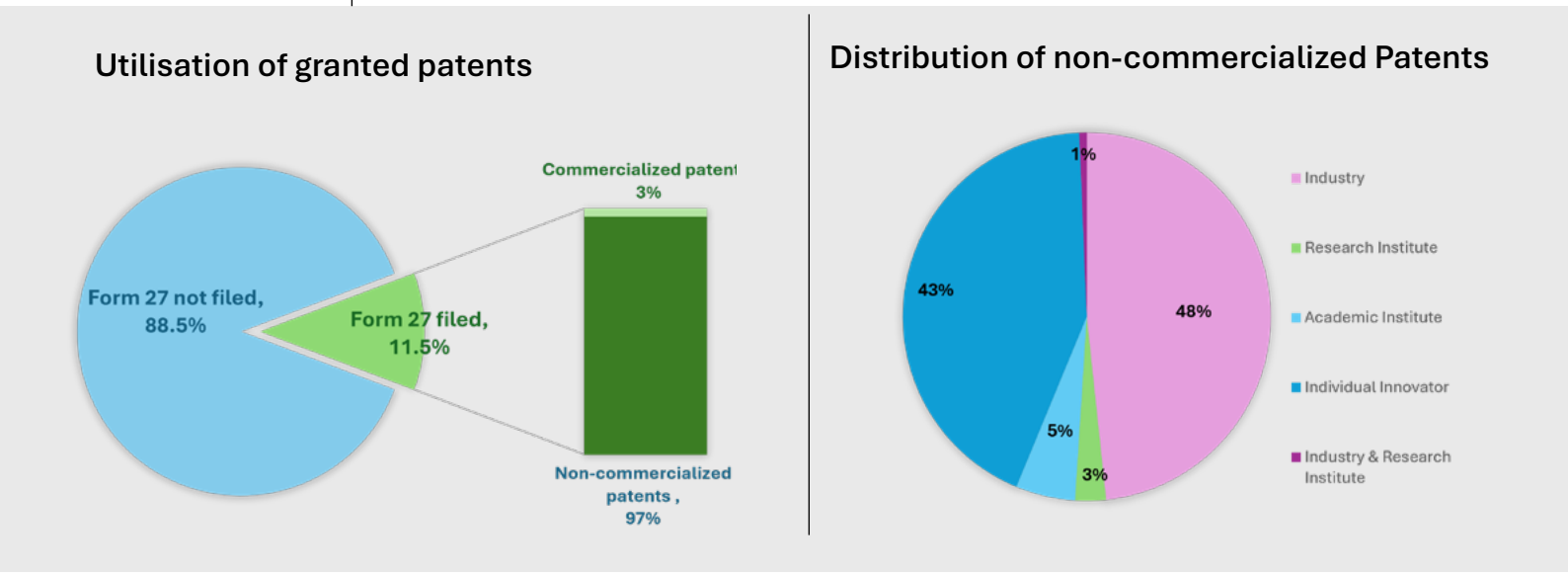



The distribution of non-commercialized patents shows that industry applicants hold the overwhelming share of 84%, showing that the vast majority of unused CD patents originate from corporate entities. Research institutes contribute 6% and academic institutes 4%, representing smaller but meaningful portions of early-stage innovations that remain uncommercialized due to barriers in scaling, funding, or collaboration. Individual innovators (5%) add a modest share, often constrained by limited access to technology-transfer pathways, while industry–research institute collaborations (1%) reflect minimal joint activity. Collectively, these figures highlight persistent gaps across the patent pipeline from ideation to market deployment, underscoring the need for stronger translational and commercialization frameworks in communicable-disease innovation.

## 5.2.2 Non-communicable diseases

Much like the situation in communicable diseases, the pattern of patent engagement in non-communicable diseases highlights a pronounced disconnect between innovation and its commercialization. As reflected in Form 27 submissions to the Indian Patent Office, only 11.5% of applicants/licensees have indicated activity related to their patents. Within this subset, a negligible 3% correspond to patents that have reached commercialization, while the remaining 97% are non-commercialized.

***Figure 5.29*** *Commercialization status as per Form 27 for granted patents in NCDs*



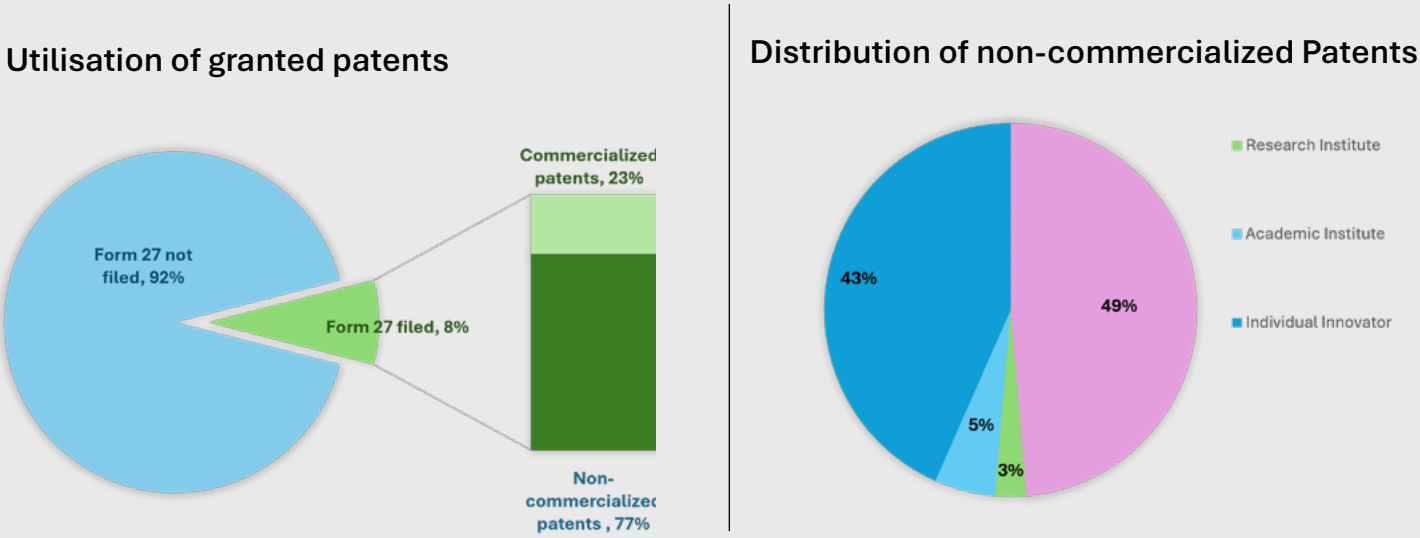

The distribution of non commercialized patents in the NCD domain shows that industry holds the largest share at 48%, meaning nearly half of unused patents originate from corporate entities. Individual innovators contribute 43%, reflecting how a significant body of promising research remains stalled at early stages due to barriers in scaling, financing, or securing industrial partnerships. Smaller proportions are attributed to academic institutions (5%) and research organizations (3%), both of which often struggle with navigating technology transfer pathways. A negligible fraction (1%) arises from joint industry–research collaborations, underscoring the limited success of collaborations.

Taken together, these figures illustrate systemic bottlenecks across the patent pipeline from ideation through deployment, where innovations fail to advance into market ready products. The data highlights not only the dominance of industry and individual inventors in holding dormant patents but also the structural challenges faced by academia and research bodies in translating intellectual property into tangible health solutions.

## 5.2.3 Maternal, Neonatal and Nutritional deficiency disorders

The working of patents data in this clshows a significant gap between patent grants and commercialization in the domain of maternal, neonatal, and nutritional-deficiency disorders. According to Form 27 data submitted to the Indian Patent Office, only 8% of total applicants/ licensees have declared the working of their patents. Of these, 23% represent patents that have been commercialized, while 77% remain non commercialized.

***Figure 5.30*** *Commercialization status as per Form 27 for granted patents in neonatal, maternal and nutritional deficiency disorders*




The distribution of non-commercialized patents reveals which segments are not translating their patents into real-world solutions. Industry accounts for 87% of the non-commercialized patents, making it the largest contributor to the commercialization gap in maternal, neonatal and nutritional deficiency disorders. This is followed by individual innovators at 4%, academic institutes at 3%, research institutes at 3% and with a small share from joint industry-research collaborations. This distribution suggests that while industry is driving most patent activity, a large portion of these inventions remain inactive, and institutions with strong research capabilities are also facing challenges in moving ideas beyond the patent stage.

### Discussion

Limited availability of Form 27 filings restricts visibility into whether patents in communicable, non communicable, and maternal/neonatal/nutritional health domains are being actively worked or not. Even when patents are filed and granted, the absence of Form 27 data makes it difficult to identify areas where innovations have stalled before progressing into market ready products. Where data is available, a significant gap between patenting and commercialization is clear, reflecting weak industry–academia collaboration and limited translation of research into deployable solutions. This lack of transparency constrains evidence based policymaking and reduces the ability to track bottlenecks in the innovation pipeline.

To bridge these gaps, India has introduced a range of initiatives designed to strengthen technology transfer and commercialization across health sectors. Programmes such as ICMR's Medical Innovation Patent Mitra, the Strengthening of Pharmaceuticals Industry (SPI) scheme, PLI schemes for medical devices and pharmaceuticals, the Startups Intellectual Property Protection (SIPP) scheme, Promotion of Research and Innovation in Pharma MedTech Sector (PRIP), MedTech Mitra, BIRAC led programmes (BIG and BioNEST), and cluster based platforms like the Andhra Pradesh MedTech Zone (AMTZ) provide integrated support for scaling, regulatory navigation, and industry–academia partnerships. Together, these efforts aim to improve technology transfer, incentivize compliance with Form 27 requirements, and enable a greater share of patented innovations to progress into impactful health solutions that strengthen national and global health security.

Chapter

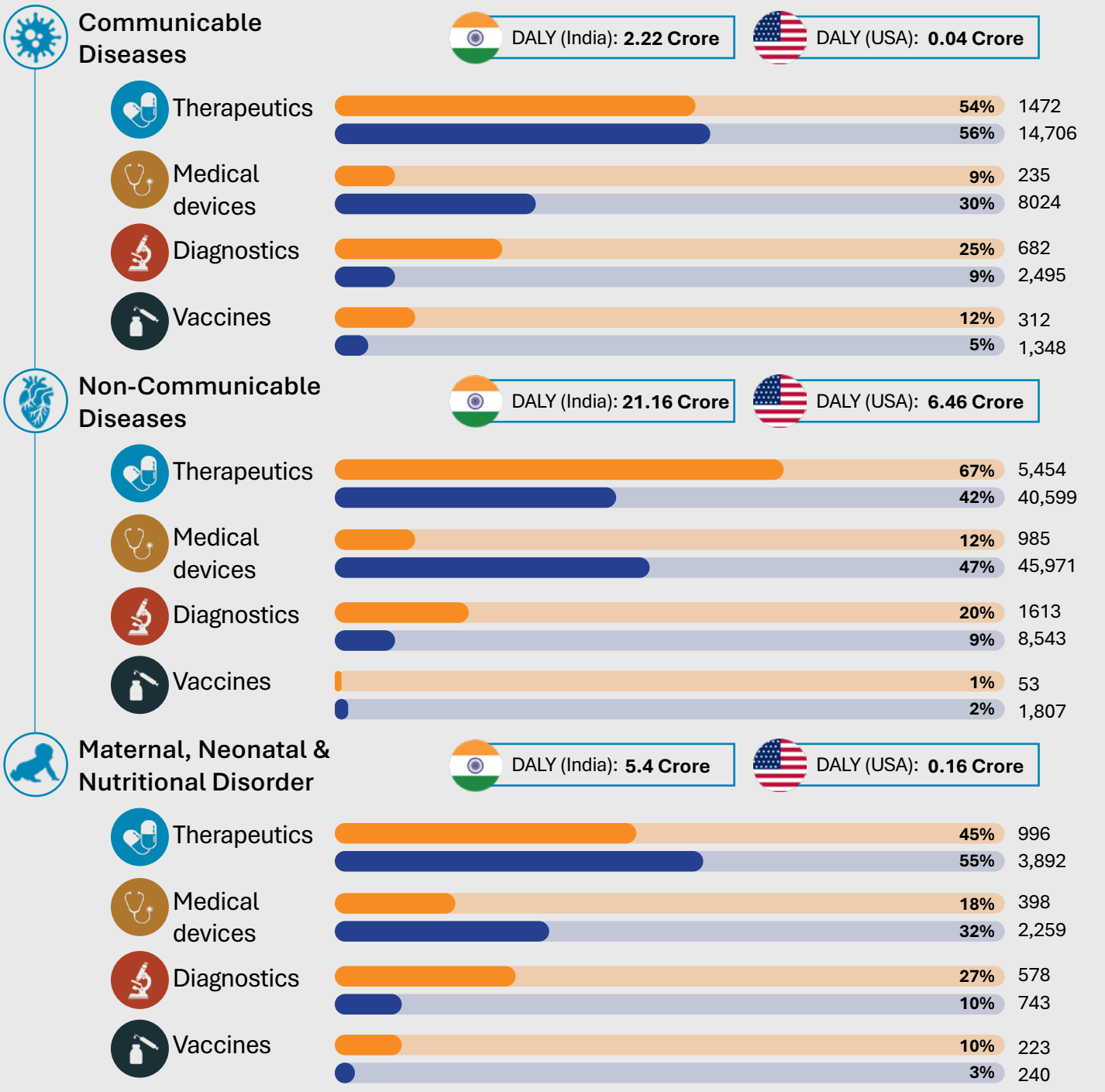
06

# India vs United States: Comparative analysis of disease burden & patent activity

# 6 India vs United States: Comparative analysis of disease burden & patent activity

India's standing within global innovation ecosystems reflects a pronounced paradox, but also a substantial strategic opportunity. The country bears a disproportionately high disease burden across communicable diseases (CDs), non-communicable diseases (NCDs), and maternal, neonatal, and nutritional deficiency disorders when measured against the United States in terms of disability-adjusted life years (DALYs). Despite this, India's contribution to global biomedical intellectual property remains relatively modest. Its share of granted patents, spanning diagnostics, medical devices, therapeutics, and vaccines, accounts for only about 10% of the output generated by the United States.

***Figure 6.1*** *Disease burden VS Granted patents: India VS USA*




**While this report focuses on the Indian biomedical patent landscape, findings in this section—especially on U.S. trends—are based on specific keywords and query strategies applied on the various relevant patent databases, which may reasonably vary across researchers, and certain patents may fall under multiple biomedical categories or indications due to broad scope of the invention.*

Importantly, this disparity does not indicate a deficiency in scientific or technical capability. Rather, it reflects systemic underrepresentation in formal intellectual property creation and protection mechanisms, suggesting structural constraints in translating research outputs and clinical need into patented innovations. This misalignment between public health burden and IP generation underscores the latent potential for India to expand its role in biomedical innovation by strengthening pathways from research to patenting and commercialization.

Frameworks issued by the Central Drugs Standard Control Organisation (CDSCO) under the Directorate General of Health Services (DGHS) establish that India already operates with a globally harmonized regulatory language clearly categorizing diagnostics into assays, diagnostic kits, and diagnostic reagents, closely aligned with the United States Food and Drug Administration (US FDA) and the European Union's In Vitro Diagnostic Regulation (EU IVDR) systems. This regulatory convergence significantly reduces friction in translating Indian innovations into globally acceptable products. While developed economies such as the United States took decades to build mature patent ecosystems through regulatory clarity, reimbursement structures, and academia-industry linkages, India now has many of these foundational elements in place, combined with a far larger unmet clinical demand acting as a powerful pull for innovation.

The patent disparity, therefore, should not be seen as a weakness but as innovation headroom. For example, in NCDs, India's disease burden is approximately 3–4 times that of the United States, yet patent filings account for only 8–10% of the United States levels. Historically, high burden environments have often become centres of frugal, scalable innovation solutions that later find global adoption. India's strengths in software, data science, regulated diagnostics, and manufacturing create a convergence point where technology enabled assays, low cost diagnostic kits, and point of care reagents can leapfrog traditional development cycles, particularly as developed markets increasingly prioritize preventive and cost effective healthcare.

Government led initiatives further amplify this momentum. Policy driven programs focused on digital health, biotechnology, medical devices, and domestic manufacturing are steadily lowering barriers to research translation, clinical validation, and IP creation. These initiatives, combined with increasing public sector procurement and startup support, are shaping an ecosystem where innovation is no longer incidental but increasingly intentional anchored to national health priorities and aligned with global standards.

In summary, while India today trails the United States in absolute patent counts, the combination of a high disease burden, globally aligned regulation, expanding R&D capacity, proactive government initiatives, and advanced digital technologies places India at an inflection point like where developed innovation economies stood two to three decades ago. This convergence marks a critical opportunity for India to emerge as a significant source of globally relevant healthcare innovation.

Chapter

07

# Way Forward

# 7 Way Forward

From the study it is evident that India has made rapid strides over the last decade in terms biomedical innovation. But the detailed analysis of the granted patents highlights that significant gaps remain in patenting activity relative to disease burden across several major communicable diseases. Conditions such as Tuberculosis (TB) continue to carry an exceptionally high disease burden but show comparatively low patenting, despite their critical public health impact. Vector-borne diseases (VBDs) also show similar pattern, with patenting activity falling short of what is expected given their substantial disease burden. In contrast, areas like Sexually transmitted diseases (STDs) show comparatively high patenting activity even though the disease burden is moderate, indicating an uneven distribution of innovation and patent protection.

Similarly, the assessment of Non-communicable diseases (NCDs) shows marked imbalances between disease burden and patenting. Cardiovascular diseases and stroke, despite representing highest disease burden, have only moderate levels of patenting, suggesting that R&D has not kept pace with the scale of the public health challenge. High-burden diseases such as Diabetes, Mental health disorders, and COPD also show disproportionately low patenting activity. At the same time, lower disease burden areas like Eye disorders, Hearing impairment, and Dental disorders show relatively high patenting activity, indicating concentrated innovation and hence patent protection in fields with stronger commercial markets. Addressing these gaps will require targeted investments and policy push for high disease burden but under-researched NCDs, stronger translational research pathways, and more robust public-private partnerships.

Further in Maternal, Neonatal, and Nutritional deficiency disorders, the analysis shows misalignment between the disease burden and the patenting patterns. Neonatal disorders carry the highest burden within this group but are associated with only moderate levels of patenting, suggesting they remain under-served by research efforts despite their substantial contribution to early-life morbidity and mortality. Nutritional-deficiency disorders show relatively more patenting even though their disease burden is lower.

Addressing these disparities will require dedicated funding streams, support for clinical translation, and stronger collaboration between industry, academia, and public health institutions to channel innovation toward areas with the highest need.

A key observation emerging from the analysis is that, although the working of patents is a statutory requirement under the Indian Patents Act (Section 146 read with Form 27), compliance remains limited, with only a small proportion (about 11%) of patentees regularly submitting working statements. Based on this partial reporting, it can be inferred that even after patents are granted, a substantial proportion remain uncommercialized, with many applicants shelving their technologies rather than advancing them to market ready solutions. This weak translation from patent to product undermines the impact of innovation across communicable diseases, non-communicable diseases, and maternal, neonatal and nutritional deficiency disorders. Limited industry uptake, weak technology transfer pathways, and insufficient support for late stage development collectively contribute to this persistent commercialization gap.

It was observed that to ensure that vaccines, therapeutics, diagnostics, and medical devices move quickly from the laboratory to the marketplace, government institutions such as ICMR, DBT, BIRAC, and CSIR consistently prioritize public health needs over patenting. This approach, demonstrated vividly during the pandemic, highlights their role in translating science into accessible solutions for India's most pressing public health needs. The true strength of these institutions lies in their research orientation like producing high impact outputs such as research papers, systematic reviews, clinical guidelines, and programmatic evidence that directly shape national health policies and global recommendations.

In the last decade, the Indian government has launched several schemes to bridge the gap between lab stage innovation and market translation. These include the Promotion of Research and Innovation in Pharma MedTech Sector (PRIP) scheme; ICMR led initiatives such as MedTech

Mitra and Patent Mitra; Department of Pharmaceuticals schemes like the Medical Device Clinical Studies Support Scheme (under SMDI); BIRAC programmes (including BIG and BioNEST); and cluster based platforms such as the Andhra Pradesh MedTech Zone (AMTZ). Complementing these are broader ecosystem building initiatives such as the Atal Innovation Mission (AIM), which promotes innovation and entrepreneurship through Atal Tinkering Labs, incubation centres, and startup support; the Startup Intellectual Property Protection (SIPP) scheme, which facilitates access to IP filing, prosecution support, and cost assistance for startups; and the KAPILA initiative, which focuses on promoting IP awareness, patent filing, and commercialization of innovations emerging from higher education institutions. Together, these policies strengthen the innovation pipeline from ideation and IP creation to protection and commercialization and aim to address gaps in translating ideas into deployable technologies. Their positive impact is expected to become more visible in the coming years.

Moving forward, a stronger ecosystem is needed to ensure that patented solutions progress beyond intellectual property filings. This includes more robust policy frameworks, incentives for working of patents, and targeted R&D investment in high-burden but low-innovation areas identified in the study.

Strengthening public-private partnerships, expanding translational research grants, and establishing programs focused on accelerating commercialization especially for neglected or underfunded disease areas will be crucial going forward. By linking innovation priorities more closely to public health needs and ensuring structured support for moving ideas from labs to the market, India can significantly improve health outcomes and make its innovation landscape more equitable and impactful.

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# 9 Disclaimer

The patent analysis in this study is based on data retrieved through selected patent databases, and results are subject to the inherent limitations, update cycles, and coverage of those sources. Search outcomes depend on the specific keywords and search strategies applied, which may reasonably vary across researchers, and certain patents may fall under multiple biomedical categories or indications due to broad scope of the invention. This is a detailed data driven assessment. While every effort has been made to ensure accuracy, ICMR or DHR assumes no responsibility or liability for any errors, omissions, or discrepancies that may arise due to variations in databases, differences in classification systems, keyword usage, or methodological limitations in search and analysis. This content should not be construed as official, legal, or regulatory advice.

The data on disease burden has been sourced from authentic sources as available on the web, which are globally accepted, like the Global Burden of Disease by Institute for Health Metrics and Evaluation and other such verified platforms. ICMR hereby disclaims any liability for any inaccuracies, omissions or consequences arising from the interpretation or reliance on the disease burden related information. ICMR hereby shall not be responsible for any information included regarding the data on disease burden as the same is provided based on the data available in the public domain. The information is intended solely for scientific and research purpose.

# 10 Abbreviations

| | |
|---|---|
| AMTZ | Andhra Pradesh MedTech Zone |
| BIG | Biotechnology Ignition Grant |
| BioNEST | Bio-incubators Nurturing Entrepreneurship for Scaling Technologies |
| BIRAC | Biotechnology Industry Research Assistance Council |
| CD | Communicable Diseases |
| CDSCO | Central Drugs Standard Control Organisation |
| CPC | Cooperative Patent Classification |
| COPD | Chronic Obstructive Pulmonary Disease |
| CSIR | Council of Scientific & Industrial Research |
| CVD | Cardiovascular Diseases |
| DALYs | Disability Adjusted Life Years |
| DBT | Department of Biotechnology |
| DGHS | Directorate General of Health Services |
| DoP | Department of Pharmaceuticals |
| ELISA | Enzyme-Linked Immunosorbent Assay |
| ESC | European Society of Cardiology |
| EU IVDR | European Union In Vitro Diagnostic Regulation (EU IVDR) |
| GBD | Global Burden of Disease |
| GII | Global Innovation Index |
| ICMR | Indian Council of Medical Research |
| IDSP | Integrated Disease Surveillance Programme (IDSP) |
| IHME | Institute for Health Metrics and Evaluation |
| IP | Intellectual Property |
| IPC | International Patent Classification |
| IPO | Indian Patent Office |
| IPR | Intellectual Property Rights |
| ISRO | Indian Space Research Organisation |
| IVD | In-vitro Diagnostics |
| JSSK | Janani Shishu Suraksha Karyakram |
| JSY | Janani Suraksha Yojana |
| MDTEC | Medical Devices Testing and Evaluation Centres |
| MoHFW | Ministry of Health and Family Welfare |
| NACP | National AIDS Control Programme |
| NCD | Non-communicable Diseases |
| NCVBDC | National Centre for Vector Borne Diseases Control |
| NMHP | National Mental Health Programme |
| NLEP | National Leprosy Eradication Programme |
| NPCDCS | National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke |

| | |
|---|---|
| NTEP | National Tuberculosis Elimination Programme |
| PLI | Production Linked Incentive |
| POSHAN | Prime Minister's Overarching Scheme for Holistic Nourishment |
| PRIP | Promotion of Research and Innovation in Pharma MedTech Sector |
| PTUAS | Pharmaceutical Technology Upgradation Assistance Scheme |
| R&D | Research and Development |
| RoW | Rest of the World |
| SEED | Scheme for Economic Empowerment of DNTs |
| SIPP | Startups Intellectual Property Protection |
| SPI | Strengthening of Pharmaceuticals Industry |
| STD | Sexually transmitted diseases |
| TB | Tuberculosis |
| US FDA | United States Food and Drug Administration |
| UIP | Universal Immunization Programme |
| USPTO | United States Patent and Trademark Office |
| VBD | Vector Borne Diseases |
| WIPO | World Intellectual Property Organization |
| YLD | Years Lived with Disability |
| YLL | Years of Life Lost |


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