



Review Article

A Brief Review On Indian Pharmaceuticals: A Formula For Success

Nilesh S. Pendbhaje¹, Rupali V. Nirmal¹, Kirti P Gandhi², Jadhav S. Anjali²

¹Lecturer, SRES' Sanjivani College of Pharmaceutical Education and Research, Kopargoan., (MH), India.

¹HOD, SRES' Sanjivani College of Pharmaceutical Education and Research, Kopargoan., (MH), India.

²Research Scholar, SRES' Sanjivani College of Pharmaceutical Education and Research, Kopargoan., (MH), India.

ARTICLE INFO

Received: 15 May 2023

Accepted: 17 May 2023

Published: 02 June 2023

Keywords:

Indian pharmaceutical,
development, history,
digitalization, success

DOI:

10.5281/zenodo.7997295

ABSTRACT

The Indian pharmaceutical industry has emerged as a major player in the global market over the past few decades. The industry has been successful in producing high-quality drugs at affordable prices, thereby meeting the healthcare needs of not only India but also many other developing and developed countries. The aim of this paper segregate in two parts i.e., success of pharmaceutical industries through their history and development and it is successful due to various parameters such as society, students, nation, digitalization etc. Overall, the Indian pharmaceutical industry has the potential to continue its growth trajectory and contribute significantly to the global healthcare sector. With its strengths in manufacturing, R&D, and a large talent pool, the industry can continue to develop and produce cost-effective, high-quality drugs for the world.

INTRODUCTION

The pharmaceutical industry is the sector of the economy that researches, develops, manufactures, and distributes drugs for use in the treatment of various diseases and medical conditions. This industry plays a crucial role in improving the health and well-being of people around the world. The pharmaceutical industry is composed of various companies, including large multinational corporations, medium-sized enterprises, and small start-ups. These companies invest significant

resources into research and development to discover and develop new drugs and therapies.

The industry is heavily regulated by government agencies, such as the Central Drug Standard Control Organization (CDSCO) in India to ensure the safety and efficacy of drugs before they are made available to the public.

The pharmaceutical industry is also subject to various challenges, such as the high cost of research and development, patent expiration, competition from generic drug manufacturers, and

*Corresponding Author: Rupali Nirmal

Address: Lecturer, SRES' Sanjivani College of Pharmaceutical Education and Research, Kopargoan., (MH), India

Email ✉: rupalinirmalcpn@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



public scrutiny over drug pricing and access to medicines. Despite these challenges, the pharmaceutical industry continues to be a vital contributor to global health and economic growth.

1.1. HISTORY AND DEVELOPMENT OF INDIAN PHARMACEUTICALS:

The pharmaceutical industry as we know it today has a long and complex history that spans thousands of years. Here are some of the key milestones and developments:

- ✚ **Ancient times:** The use of natural remedies for various ailments dates back to ancient civilizations, including the Egyptians, Greeks, and Chinese. Many of these remedies relied on plants and herbs that are still used today in modern medicine.
- ✚ **Middle Ages:** During the Middle Ages, apothecaries (early pharmacists) emerged in Europe, selling a wide range of remedies and potions. These apothecaries were often part of religious orders and were responsible for collecting and dispensing medicinal plants.
- ✚ **19th century:** The modern pharmaceutical industry began to take shape in the 19th century, with the discovery of several key drugs, including morphine and quinine. This period also saw the rise of chemical synthesis and the development of new techniques for isolating and purifying active compounds.
- ✚ **20th century:** The 20th century saw significant advances in drug discovery and development, including the introduction of antibiotics, vaccines, and insulin. The industry also began to shift from small-scale, family-run businesses to large multinational corporations.
- ✚ **Modern era:** Today, the pharmaceutical industry is a global behemoth, with an estimated worth of over \$1.2 trillion. Major developments in recent years include the rise of biotechnology and personalized medicine,

as well as ongoing debates over drug pricing, regulation, and access.

Throughout its history, the pharmaceutical industry has faced numerous challenges and controversies, including concerns over drug safety, pricing, and ethical issues related to clinical trials and intellectual property. Nonetheless, it remains a crucial part of modern healthcare, with the potential to save countless lives and improve quality of life for millions of people around the world.

1.2. GROWTH OF INDIAN PHARMACEUTICALS:[11]

The history of Indian pharmaceuticals dates back to the early 20th century. The first modern pharmaceutical company in India, Bengal Chemical and Pharmaceutical Works Ltd., was established in 1901. The company was set up with the aim of manufacturing indigenous medicines to replace the imported ones.

During the early decades, Indian pharmaceutical companies mostly produced generic medicines and copied drugs developed by foreign companies. However, in the 1970s, the Indian government implemented the Patent Act, which enabled local companies to develop their own drugs and compete in the global market.

This led to a surge in the growth of the Indian pharmaceutical industry, with companies like Ranbaxy, Cipla, and Dr. Reddy's Laboratories becoming major players in the global market. These companies were able to offer low-cost generic versions of drugs developed by multinational pharmaceutical companies, which helped to bring down the cost of medicines and improve access to healthcare.

In recent years, the Indian pharmaceutical industry has evolved from being a mere supplier of low-cost generics to becoming a major player in the global pharmaceutical market. The industry has invested heavily in research and development and has been successful in developing new drugs and



treatments for a range of diseases. Today, India is the world's largest supplier of generic medicines, accounting for 20% of the global supply. The country's pharmaceutical industry is valued at over \$40 billion and is expected to continue to grow in the coming years.

1.3. SUCCESS FORMULA FOR PHARMACEUTICAL INDUSTRY:

There is no single formula for success in the pharmaceutical industry, as success can be influenced by a multitude of factors. However, here are some key elements that can contribute to success in the pharmaceutical industry:

- ✚ **Research and Development:** Investing in research and development is crucial for developing innovative and effective drugs. Pharmaceutical companies need to continually invest in R&D to stay ahead of the competition and bring new drugs to market.
- ✚ **Regulatory Compliance:** The pharmaceutical industry is heavily regulated, and companies need to comply with strict regulations and standards set by regulatory bodies. Compliance with regulations is crucial for maintaining trust with customers and stakeholders.
- ✚ **Marketing and Sales:** Effective marketing and sales strategies are important for promoting and selling pharmaceutical products. Companies need to develop marketing and sales strategies that are ethical, informative, and effective at reaching target audiences.
- ✚ **Collaboration and Partnerships:** Collaborating with other companies and organizations can help pharmaceutical companies share resources, expertise, and knowledge to develop better products and achieve shared goals.
- ✚ **Talent Management:** Attracting and retaining talented employees is crucial for success in the pharmaceutical industry.

Companies need to create a supportive and inclusive work environment that fosters innovation and encourages employees to develop their skills and expertise.

- ✚ **Financial Management:** Sound financial management is important for sustaining long-term success in the pharmaceutical industry. Companies need to manage their finances effectively, including managing costs, investing in growth, and maintaining a strong balance sheet.

1.3.1. Factors that have contributed to its success:

The Indian pharmaceutical industry has been experiencing significant growth in recent years, and there are several factors that have contributed to its success.

- ✚ **Low-cost manufacturing:** India has become a hub for low-cost manufacturing due to its large pool of skilled labour, low production costs, and favourable government policies. This has enabled Indian pharmaceutical companies to offer their products at a lower price point than many of their competitors.
- ✚ **Research and development:** The Indian pharmaceutical industry has invested heavily in research and development, with many companies focusing on developing generic versions of existing drugs. This has enabled Indian companies to produce drugs at a fraction of the cost of their branded counterparts.
- ✚ **Regulatory environment:** India has a well-established regulatory environment that is conducive to the growth of the pharmaceutical industry. The country has a robust regulatory framework that ensures the safety and efficacy of pharmaceutical products, and this has helped to build trust among consumers.
- ✚ **Global demand:** The global demand for pharmaceuticals is growing rapidly, and Indian companies are well positioned to take



advantage of this trend. Many Indian companies have established themselves as key players in the global pharmaceutical industry, with a strong presence in markets across the world.

Innovation: Indian pharmaceutical companies have been increasingly focused on innovation in recent years. This has enabled them to develop new drugs and treatments that meet the evolving needs of patients and healthcare providers. Overall, the Indian pharmaceutical industry has a winning formula for success, with low-cost manufacturing, strong research and development capabilities, a favourable regulatory environment, global demand, and a focus on innovation. As the industry continues to grow and evolve, it is likely that Indian companies will continue to play a key role in the global pharmaceutical industry.

1.4. INDIAN PHARMACEUTICALS IS SUCCESS FOR: [12]

There are various parameters contributes in for success in pharmaceutical industries, are given in fig. 01.

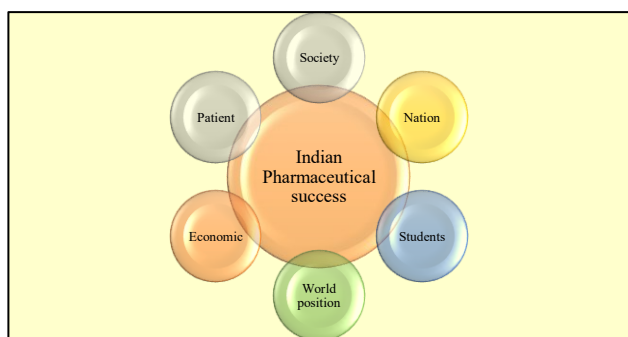


Fig. 01. List of Indian Pharmaceuticals Success

A. Indian pharmaceutical for society:

The Indian pharmaceutical industry has had a significant impact on society, both in India and around the world. Here are some of the ways in which the industry has affected society:

Improved Access to Healthcare: The Indian pharmaceutical industry is known for producing

affordable medicines, including generic drugs, which have improved access to healthcare for people around the world. This has helped to reduce the burden of healthcare costs on individuals and governments.

Economic Growth: The pharmaceutical industry has contributed significantly to India's economic growth, creating jobs and generating revenue. The industry has also attracted foreign investment, which has further boosted the economy.

Research and Development: The Indian pharmaceutical industry has invested heavily in research and development, leading to the discovery of new molecules and drugs. This has helped to improve healthcare outcomes and has contributed to scientific progress globally.

Case: During the COVID-19 pandemic, India has emerged as a major supplier of COVID-19 vaccines and other drugs such as Remdesivir, Tocilizumab, and Favipiravir. The country has also been at the forefront of COVID-19 vaccine development and manufacturing, with two indigenous vaccines, Covaxin and Covishield, being developed and manufactured in India.

Innovation: The Indian pharmaceutical industry has been at the forefront of innovation, developing new technologies and processes to improve drug development and manufacturing.

Improved Quality of Life: The medicines produced by the Indian pharmaceutical industry have improved the quality of life for people suffering from various diseases and conditions, including cancer, diabetes, and heart disease.

Philanthropic Initiatives: Many Indian pharmaceutical companies have launched philanthropic initiatives to improve healthcare outcomes in India and other developing countries. These initiatives have focused on improving access to healthcare, providing free medicines to those in need, and supporting healthcare infrastructure development. Overall, the Indian pharmaceutical industry has had a positive impact

on society, improving access to healthcare, boosting economic growth, contributing to scientific progress, and improving the quality of life for people around the world.

B. Indian pharmaceutical success for students:

The success of the Indian pharmaceutical industry may have several effects on students in India.

Firstly, it could inspire students to pursue careers in the field of pharmaceuticals and biotechnology. India is one of the world's largest producers of generic medicines, and the success of the industry could motivate students to explore career opportunities in pharmaceutical research, manufacturing, quality control, and marketing.

Secondly, the success of the Indian pharmaceutical industry could lead to an increase in employment opportunities for students. This could result in more job opportunities for fresh graduates and experienced professionals, as well as internships and training programs for students.

Thirdly, the success of the Indian pharmaceutical industry could lead to an increase in research and development activities. This could result in more funding opportunities for students pursuing higher education in the field of pharmaceuticals and biotechnology.

Overall, the success of the Indian pharmaceutical industry could have a positive impact on students in India by inspiring them to pursue careers in the industry, creating more job opportunities, and increasing research and development activities.

C. Indian pharmaceutical success for nation:

The Indian pharmaceutical industry has achieved remarkable success over the years and has become a key contributor to the nation's economy. Here are some reasons why:

Affordable Healthcare: India's pharmaceutical industry is known for providing affordable healthcare solutions to the world. The generic drugs produced by Indian pharmaceutical companies are cheaper than their counterparts in

other countries, making them accessible to a larger population. This has made India the largest provider of generic medicines globally.

Innovation: India's pharmaceutical industry has been focusing on innovation, which has helped it to expand its reach globally. Many Indian pharmaceutical companies have invested heavily in research and development, leading to the discovery of new molecules and drug.

Export earnings: A successful pharma industry can generate export earnings for a nation by selling drugs and other products to other countries.

Tax revenues: The pharma industry can also contribute to a nation's tax revenues, which can be used to fund healthcare and other social programs. Overall, a successful pharma industry can have a positive impact on a nation's health, economy, and innovation, making it an important contributor to national development.

- Indian Pharmaceuticals is indeed a success story. India has emerged as a major player in the global pharmaceutical industry over the past few decades, with its pharmaceutical sector growing rapidly in terms of both domestic production and exports.
- The Indian pharmaceutical industry is known for its high-quality yet affordable generic drugs, which have helped improve access to healthcare in many parts of the world, especially in developing countries. Indian companies have also been at the forefront of developing innovative drugs and vaccines for various diseases, including cancer, HIV/AIDS, and COVID-19.
- The success of the Indian pharmaceutical industry can be attributed to several factors, including a strong regulatory framework, a highly skilled workforce, a robust R&D ecosystem, and cost-effective manufacturing practices. The industry has also been able to leverage India's strengths in IT and digital

technologies to drive innovation and efficiency.

Overall, the Indian pharmaceutical industry has played a crucial role in improving global health outcomes and driving economic growth in India. It is a shining example of how a developing country can build a world-class industry and compete successfully in the global marketplace.

D. Indian pharmaceuticals world position:

India is a major player in the global pharmaceutical industry and has become known as the "pharmacy of the world." The Indian pharmaceutical sector is the third largest in the world in terms of volume and ranks 13th in terms of value. According to the Indian Brand Equity Foundation (IBEF), the Indian pharmaceutical market was valued at \$41.2 billion in 2020 and is expected to reach \$130 billion by 2030. India's pharmaceutical industry is known for its high-quality generic drugs, which are sold at affordable prices in both domestic and international markets.

Indian companies have a significant presence in many countries around the world, including the United States, Europe, and Africa. Indian pharmaceutical companies are also known for their strong research and development (R&D) capabilities. Many Indian companies invest heavily in R&D to develop new drugs and formulations. According to a report by the Department of Pharmaceuticals, the Indian pharmaceutical industry invested about \$3.8 billion in R&D in 2020. Overall, India's pharmaceutical industry is a major contributor to the country's economy and has a significant impact on global health. With its strong manufacturing capabilities and research expertise, India is likely to remain a key player in the global pharmaceutical industry for years to come.

E. India is home to a number of major pharmaceutical industries. Some of the largest pharmaceutical companies in India with their annual turnover are given in **table. 01**.

Table. 01. List of top 10 pharmaceutical industries

Sr. No.	Name of Industries	Year of est.	Owner	Headquarters	Turnover
1	Sun Pharmaceutical Industries Ltd.	1983	Dilip Shanghvi	Goregaon, Mumbai	\$5.0 billion
2	Dr. Reddy's Laboratories Ltd.	1984	Dr. Kallam Anji Reddy	Hyderabad	\$2.9 billion (20)
3	Lupin Ltd.	1968	Mrs. Manju D Gupta (W/o Desh Bandhu Gupta)	Mumbai	\$2.0 billion (2021)
4	Cipla Ltd.	1935	Yusuf Hamied	Mumbai	\$2.9 billion
5	Aurobindo Pharma Ltd.	1986	P. V. Ramaprasad Reddy and Mr. K. Nityananda Reddy	Hyderabad	\$3.3 billion (FY20)
6	Cadila Healthcare Ltd.	1952	Pankaj Patel	Ahmedabad	\$2.1 billion (FY21)
7	Torrent Pharmaceuticals Ltd.	1959	Sudhir Mehta	Ahmedabad	1.1 billion (2022)
8	Biocon Ltd.	1978	Kiran Mazumdar-Shaw	Bengaluru	\$1.1 billion (2022)

9	Glenmark Pharmaceuticals Ltd.	1977	Glenn Saldanha	Mumbai	\$416.76 million (INR 3,125.43 crore in Q2 FY22)
10	Alkem Laboratories Ltd.	1973	Samprada Singh	Mumbai	\$1.4 billion (2022)

These companies are involved in the development, manufacture, and distribution of a wide range of pharmaceutical products, including generic drugs, branded drugs, biosimilars, and active pharmaceutical ingredients (APIs). India has a thriving pharmaceutical industry and is known for its high-quality and cost-effective pharmaceutical products.

F. Indian Pharmaceutical Regulation:

The Indian pharmaceutical industry is regulated by the Central Drugs Standard Control Organization (CDSCO) and governed by the Drugs and Cosmetics Act, 1940 and the Rules, 1945. There are several government policies that impact the Indian pharmaceutical industry, some of which are:

National Pharmaceutical Pricing Policy: The National Pharmaceutical Pricing Policy aims to regulate the prices of essential drugs in the country to make them affordable and accessible to the general public. The government sets the prices of drugs that are on the National List of Essential Medicines (NLEM).

Patent Law: The Patent Law in India, which was amended in 2005, allows for the grant of product patents for pharmaceuticals. This has led to increased foreign investment in the sector, and has encouraged the development of new drugs.

Research and Development Incentives: The government provides various incentives to promote research and development in the pharmaceutical industry. These include tax incentives for companies that invest in research and development, and funding for collaborative research projects with academic institutions.

Foreign Direct Investment (FDI): The Indian government allows 100% FDI in the pharmaceutical sector, subject to certain conditions. This has led to increased investment in the industry and has helped to create jobs.

Make in India Initiative: The Make in India Initiative is a government policy that aims to promote the manufacturing of products in India, including pharmaceuticals. This policy has helped to boost the domestic pharmaceutical industry and has created job opportunities.

Overall, the Indian government's policies are aimed at promoting innovation, affordability, and accessibility of drugs, as well as boosting the domestic pharmaceutical industry.

G. Digitalization of the Pharma Industry:

Digitalization is revolutionizing the drug discovery process by allowing pharmaceutical companies to leverage advanced technologies and data analysis to accelerate and optimize their research efforts. Here are some ways in which digitalization is transforming drug discovery. All aspects are shown in fig. 02.

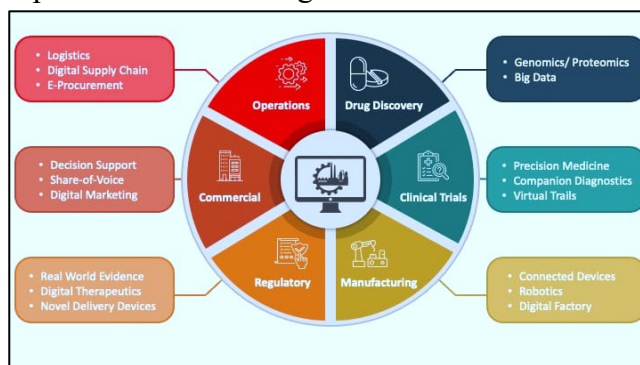


Fig. 02. digitalization of the pharma industry

Machine learning and artificial intelligence (AI): AI and machine learning algorithms can

analyze vast amounts of data and help researchers identify patterns and correlations that may be missed by traditional methods. This enables faster and more accurate drug discovery, as well as personalized medicine.

Big data analytics: Digitalization enables pharmaceutical companies to collect and analyze large amounts of data from various sources, including genomics, proteomics, and medical records. This data can be used to identify new drug targets, optimize clinical trial design, and identify patient subgroups that may benefit from specific therapies.

In silico drug design: Digitalization allows for the use of computational methods to design and optimize drug molecules and predict their efficacy and safety. This enables researchers to accelerate the drug discovery process and reduce costs associated with experimental testing.

High-throughput screening: Digitalization allows for the use of robotic and automated systems to test large numbers of compounds and identify potential drug candidates more quickly and efficiently.

Collaborative research: Digitalization allows for pharmaceutical companies to collaborate with academic institutions, research organizations, and other industry partners to share data, expertise, and resources. This enables more efficient drug discovery and faster translation of research into clinical practice.

Overall, the digitalization of drug discovery is transforming the pharmaceutical industry, allowing for faster, more efficient, and more cost-effective drug discovery, with the potential to improve patient outcomes and reduce the time and cost of bringing new therapies to market.

H. The digitalization of the pharma industry in Clinical Trials:

has been accelerating in recent years, particularly in the area of clinical trials and operations. Digital technologies are being leveraged to streamline and

automate various aspects of drug development and clinical trials, including:

Data collection and management: Digital tools such as electronic data capture (EDC) systems and electronic patient-reported outcomes (ePRO) enable more efficient and accurate data collection, reducing errors and improving the speed of data analysis.

Patient recruitment and engagement: Digital tools such as social media, patient portals, and mobile apps can help increase patient recruitment and engagement in clinical trials, making it easier for patients to participate and stay engaged throughout the trial.

Monitoring and safety: Digital technologies such as wearables and sensors can provide real-time monitoring of patients during clinical trials, allowing for early detection of adverse events and improved patient safety.

Supply chain management: Digital tools such as blockchain can help improve the transparency and traceability of the drug supply chain, reducing the risk of counterfeiting and improving the efficiency of drug distribution.

Artificial intelligence (AI) and machine learning (ML): These technologies are being used to analyze large amounts of data and identify patterns and insights that can inform drug development and clinical trial design.

Overall, digitalization is transforming the pharma industry by increasing efficiency, improving patient outcomes, and reducing costs. However, there are also challenges to be addressed, such as data privacy and security concerns, the need for regulatory guidance, and the need for skilled professionals to manage and analyze the data generated by these digital tools.

I. Digitalization has also been transforming the pharma industry in the area of manufacturing.



Digital technologies are being leveraged to improve the efficiency, quality, and safety of drug production, including:

Process optimization: Digital tools such as process analytical technology (PAT), artificial intelligence (AI), and machine learning (ML) are being used to optimize manufacturing processes, reducing variability and improving efficiency.

Quality control: Digital technologies such as real-time monitoring, automated inspection, and advanced analytics are being used to improve product quality and reduce defects.

Supply chain management: Digital tools such as blockchain and other traceability technologies are being used to improve the transparency and traceability of the drug supply chain, reducing the risk of counterfeiting and improving the efficiency of drug distribution.

Regulatory compliance: Digital technologies such as electronic batch records (EBRs) and electronic data exchange (EDI) are being used to improve compliance with regulatory requirements, reducing the risk of non-compliance and improving the efficiency of regulatory inspections.

Predictive maintenance: Digital tools such as the internet of things (IoT) and AI are being used to predict equipment failures and improve maintenance schedules, reducing downtime and improving production efficiency.

Overall, digitalization is transforming the pharma industry in manufacturing by increasing efficiency, improving quality, and reducing costs. However, there are also challenges to be addressed, such as data privacy and security concerns, the need for regulatory guidance, and the need for skilled professionals to manage and analyze the data generated by these digital tools.

J. Digitalization has also had a significant impact on the regulatory aspects of the pharma industry, particularly in the areas of drug approval and compliance. Here are some

ways digitalization is transforming the regulatory landscape:

Electronic submissions: The use of electronic submissions has made it easier and faster for pharmaceutical companies to submit data and other information to regulatory authorities. This has significantly reduced the time it takes for new drugs to gain approval.

Electronic records and data management: Digital technologies are being used to manage regulatory records and data, including electronic records of clinical trials, manufacturing processes, and adverse event reporting. This has increased the efficiency and accuracy of regulatory compliance and reduced the risk of errors.

Regulatory compliance software: Software solutions are available to help pharmaceutical companies manage regulatory compliance. These tools provide automated workflows, document management, and other features to help companies comply with regulations and avoid penalties.

Digital inspections: Regulatory authorities are increasingly using digital tools to conduct inspections of pharmaceutical companies. This includes remote inspections and the use of digital technologies such as video conferencing and document sharing to make inspections more efficient and effective.

Data analytics: Regulatory authorities are using data analytics to monitor drug safety and effectiveness. This includes the use of data mining techniques to identify safety signals and other patterns in large data sets.

Overall, digitalization is transforming the regulatory landscape of the pharma industry by increasing efficiency, reducing errors, and improving compliance. However, there are also challenges to be addressed, such as data privacy and security concerns, the need for regulatory guidance, and the need for skilled professionals to manage and analyze the data generated by these digital tools.

1.5. THE PHARMACEUTICAL INDUSTRY CAN BE CONSIDERED A SUCCESS FOR SEVERAL REASONS, INCLUDING:

Developing life-saving drugs: The pharmaceutical industry has developed many life-saving drugs that have significantly improved the quality of life and increased the life expectancy of people suffering from various diseases. Diseases that were once considered incurable are now treatable due to the development of new drugs and therapies.

Economic impact: The pharmaceutical industry contributes significantly to the global economy by creating jobs, generating revenue, and driving innovation. It is estimated that the global pharmaceutical market will reach a value of \$1.5 trillion by 2023.

Innovation: The pharmaceutical industry is highly innovative and invests a significant amount of money in research and development. This has led to the discovery of new drugs and therapies, which have significantly improved patient outcomes.

Improved healthcare access: The pharmaceutical industry has played a significant role in improving healthcare access by providing affordable drugs to people in both developed and developing countries. Generic drugs, which are much cheaper than brand-name drugs, have made it possible for millions of people to access life-saving drugs.

Collaboration: The pharmaceutical industry collaborates with academia, governments, and other stakeholders to drive innovation and find solutions to some of the world's most pressing health problems.

Overall, the pharmaceutical industry's success can be attributed to its contributions to improving global health, driving innovation, and generating economic growth.

1.6. CHALLENGES: The Indian pharmaceutical industry, despite its success, faces several

challenges that can potentially hinder its growth and success in the future. Some of the major challenges faced by the industry include:

- **Increasing competition:** The Indian pharmaceutical industry is facing stiff competition from other emerging markets like China, Brazil, and South Korea. This competition is intensifying, particularly in the generic drugs segment, and can potentially impact the industry's profitability.
- **Rising regulatory compliance costs:** The regulatory compliance costs for the Indian pharmaceutical industry have been increasing in recent years. Compliance with various international regulatory standards is becoming more stringent, and this has led to increased costs for companies. This could make it difficult for smaller players to remain competitive.
- **Intellectual property rights issues:** Intellectual property rights (IPR) are a significant issue for the Indian pharmaceutical industry. The country's patent laws are still evolving, and this has led to several legal disputes with global pharmaceutical companies. This could potentially impact the industry's access to new technologies and innovation.
- **Quality control and manufacturing practices:** The Indian pharmaceutical industry has faced several quality-related issues in recent years. Improving quality control and manufacturing practices is essential for maintaining the industry's reputation and competitiveness in the global market.
- **Skilled workforce shortage:** While India has a large pool of skilled and qualified manpower, there is still a shortage of skilled workers in certain areas such as research and development, regulatory



affairs, and quality control. This shortage could potentially impact the industry's growth and innovation capabilities. Overall, these challenges require the Indian pharmaceutical industry to focus on innovation, improving efficiency, and developing new technologies to remain competitive in the global market.

1.7. INVESTMENTS AND RECENT DEVELOPMENTS OF INDIAN PHARMACEUTICALS:

- The FDI inflows in the Indian drugs and pharmaceuticals sector reached US\$ 19.90 billion between April 2000-June 2022.
- The Indian pharmaceutical industry generated a trade surplus of US\$ 15.81 billion in FY22.

1.8. GOVERNMENT INITIATIVES:

- As per the Union Budget 2022-23:
 - Rs. 3,201 crore (US\$ 419.2 million) has been set aside for research and Rs. 83,000 crore (US\$ 10.86 billion) has been allocated for the Ministry of Health and Family Welfare.
 - Rs. 37,000 crore (US\$ 4.83 billion) has been allocated to the 'National Health Mission'.
 - Rs. 10,000 crore (US\$ 1.28 billion) has been allocated to Pradhan Mantri Swasthya Suraksha Yojana.
 - The Ministry of AYUSH has been allocated Rs. 3,050 crore (US\$ 399.4 million), up from Rs. 2,970 crore (US\$ 389 million).
- To achieve self-reliance and minimise import dependency in the country's essential bulk drugs, the Department of Pharmaceuticals initiated a PLI scheme to promote domestic manufacturing by setting up greenfield plants with minimum domestic value addition in four separate 'Target Segments' with a

cumulative outlay of Rs. 6,940 crore (US\$ 951.27 million) from FY21 to FY30.[10]

CONCLUSION

This success has not only contributed to the growth of the industry but also had a positive impact on the nation, students, and society. The industry has created numerous job opportunities for skilled professionals, contributed significantly to the national economy, and helped the country achieve self-sufficiency in terms of essential medicines. Moreover, the industry has also played a crucial role in providing affordable healthcare solutions to millions of people globally, especially in developing countries, thereby contributing to the development of society. To continue this success, it is important for the industry to focus on innovation, invest in research and development, and maintain high-quality standards. At the same time, it is equally important for the government to continue to provide supportive policies and create an enabling environment for the industry to thrive. In conclusion, the Indian pharmaceutical industry has been a key contributor to the nation's growth, the development of the industry, and society's well-being. By continuing to focus on innovation and maintaining high standards, the industry can sustain its success, create more jobs, and continue to contribute to the growth of the nation and society.

REFERENCES

1. Shanthi Balasubramanian "Global Pharmaceutical Industry: Overview and Prospects" *International Journal of Research in Business and Social Science*. (2013) 23-39.
2. Akhtar, Dr. *Indian Pharmaceutical Industry: An Overview*. *IOSR Journal of Humanities and Social Science*. (2013). 13. 51-66.
3. P. Srivastava and A. Bhatnagar "Pharmaceutical Industry: An Overview" *Journal of Applied Pharmaceutical Science*. (2011)



4. https://pharmaphorum.com/rd/a_history_of_the_pharmaceutical_industry
5. Dailey, J. W. pharmaceutical industry. Encyclopedia Britannica. <https://www.britannica.com/technology/pharmaceutical-industry>(2023, February 15).
6. Saha, C. N., & Bhattacharya, S. Intellectual property rights: An overview and implications in pharmaceutical industry. *Journal of advanced pharmaceutical technology & research*, (2011). 2(2), 88.
7. Chaudhuri, Sudip. The Gap Between Successful Innovation and Access to Its Benefits: Indian Pharmaceuticals. *European Journal of Development Research*. (2007). 19. 49-65.
8. Banerjee K, Thakurta R. Innovations in the Indian pharmaceutical industry: The present scenario and an agenda for the future. *Journal of Generic Medicines.*; (2015,12(2):50-59.
9. Balganes T, Kundu TK, Chakraborty TK, Roy S. Drug discovery research in India: current state and future prospects. *ACS Med Chem Lett.*; (2014), 5(7):724-6.
10. <https://www.ibef.org/industry/pharmaceutical-india>
11. Hole, G., Hole, A. S., & McFalone-Shaw, I. Digitalization in pharmaceutical industry: What to focus on under the digital implementation process? *International Journal of Pharmaceutics: X*, (2021). 3, 100095.
12. <https://timesofindia.indiatimes.com/blogs/voices/indian-pharmaceutical-industry-pillar-of-indias-growth/>
13. https://en.wikipedia.org/wiki/Pharmaceutical_industry_in_India
14. Glenn Hole, Anastasia S. Hole, Ian McFalone-Shaw, “Digitalization in pharmaceutical industry: What to focus on under the digital implementation process?” *International Journal of Pharmaceutics: X*, (2021), Volume 3,100095.
15. https://www.ey.com/en_in/health/how-the-indian-pharmaceutical-industry-may-transform-post-pandemic.

HOW TO CITE: Nilesh S. Pendbhaje, Rupali V. Nirmal, Kirti P Gandhi, Jadhav S. Anjali, A Brief Review On Indian Pharmaceuticals: A Formula For Success, *Int. J. in Pharm. Sci.*, 2023, Vol 1, Issue 6, 1-12. <https://doi.org/10.5281/zenodo.7997295>

