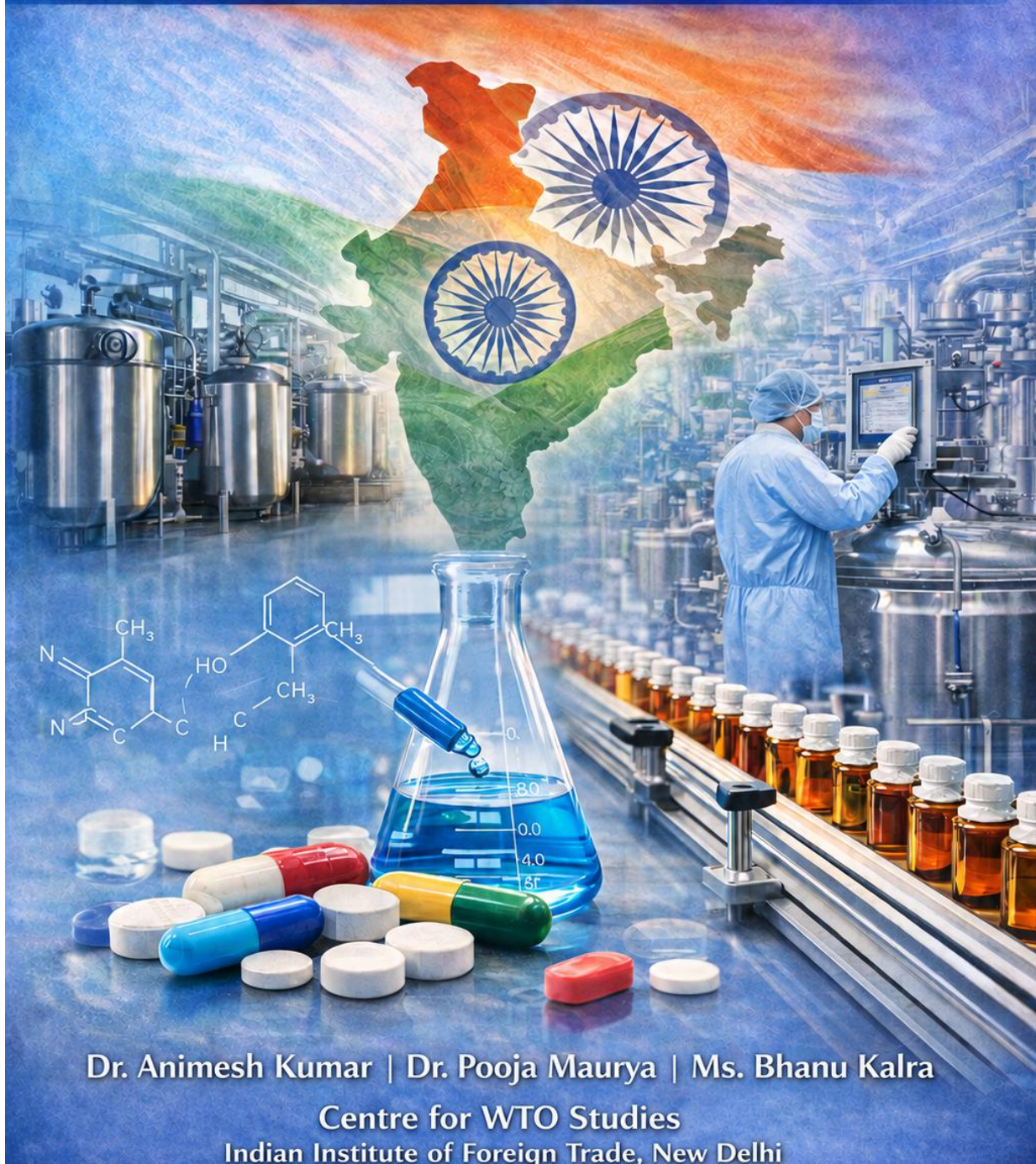


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# Securing India's **ANTIBIOTIC** API SUPPLY

*Reducing Import Dependency and Strengthening Domestic Manufacturing*



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## Reducing Import Dependency and Strengthening Domestic Manufacturing

### 1. Introduction

Antibiotics are one of the most significant medical advances in history, and they serve as the foundation of global healthcare and pharmaceutical trade. They not only save millions of lives each year, but they also support the global pharmaceutical industry's value chains, which are inextricably intertwined across borders. The international antibiotics market, worth tens of billions of dollars, includes the manufacturing of active pharmaceutical ingredients (APIs), intermediates, and completed formulations, with large contributions from a few important producing countries. The primary end users of Antibiotic APIs are contract manufacturers and contract development and manufacturing organisations (CMOs/CDMOs); veterinary drug makers; intermediate/bulk-drug processors, and downstream wholesalers, tendering/ procurement agencies, hospitals and large pharmacies. The pharmaceutical and biotechnology industry segment accounts for major share in the market due to its extensive use of APIs in drug discovery, development and large-scale commercial manufacturing.<sup>1</sup>

The global antibiotics market is a key component of the pharmaceutical business. The market is expected to reach USD 73.8 billion by 2033, growing at a 3.3% CAGR between 2025 and 2033<sup>2</sup>. This expansion is being driven by ongoing demand for antibacterial medicines, rising healthcare spending, and increased access to modern medicine in developing economies.

Within this global framework, India has emerged as a key production and export hub, offering low-cost, high-quality antibiotics to both industrialised and developing economies. However, India remains significantly reliant on imported APIs and intermediates for essential antibiotic groups such as penicillins, cephalosporins, and macrolides. This dependency exposes the country to supply shortages and price fluctuations, compromising both domestic healthcare availability and export competitiveness.

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<sup>1</sup> <https://www.marketsandmarkets.com/Market-Reports/API-Market-263.html>

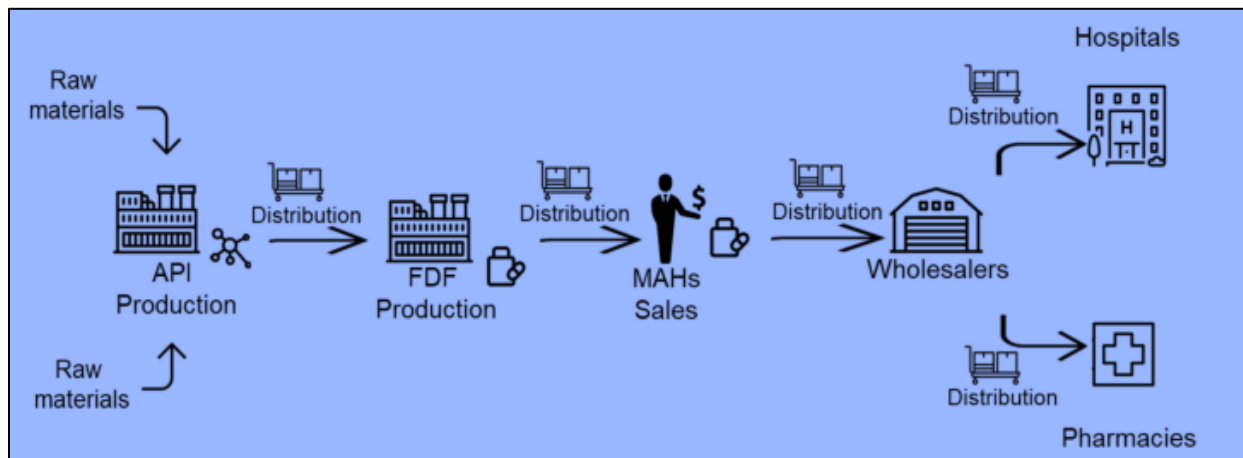
<sup>2</sup> <https://www.imaregroup.com/antibiotics-market>

## 2. The Global Antibiotics Value Chain

The worldwide antibiotic supply chain functions within a highly integrated but fragile Global Value Chain (GVC) structure, with a few nations dominating important phases of production. This concentration is a major risk, as China primarily supplies key antibiotic ingredients such as penicillin and cephalosporin cores, on which India remains heavily dependent.

A typical antibiotic GVC includes five steps: API producer (Active Pharmaceutical Ingredient: the main raw materials to produce drugs); FDF producer (Final Dosage Formulation), who receives API and excipients to produce the final-formulation drug (e.g., pills, drinkable mixtures, injectables); MAH (Market Authorization Holder), that is, the actor selling the final product in a given country; wholesaler (holding local inventories); hospital for in-care use or pharmacy for out-care use (Figure 1).

*Figure 1: Supply Chain of Antibiotics Market*

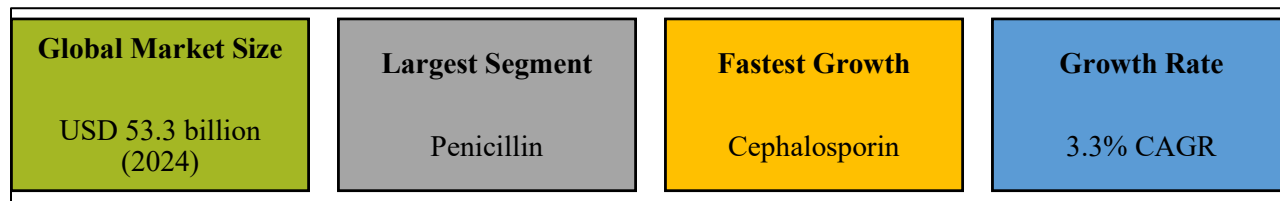


*Source: Authors adaptation*

Antibiotics GVCs are typically vertically de-integrated. After several waves of offshoring since the 1990s, production has become geographically concentrated, with Chinese companies mainly making APIs and Indian companies mainly making finished antibiotic products. MAHs can be small local firms serving only one country or large multinational companies with many products and markets. This concentration of key production stages in only a few countries creates a weakness in the antibiotic supply chain, increasing vulnerability to geopolitical risks.

Beta-lactams are the most popular antibiotics in both India and worldwide due to their broad-spectrum activity, proven health benefits, and widespread use in primary and hospital care. Figure 2 presents the snapshot of India's antibiotic market for 2025-2033.

*Figure 2: Market Snapshot: 2025-2033*

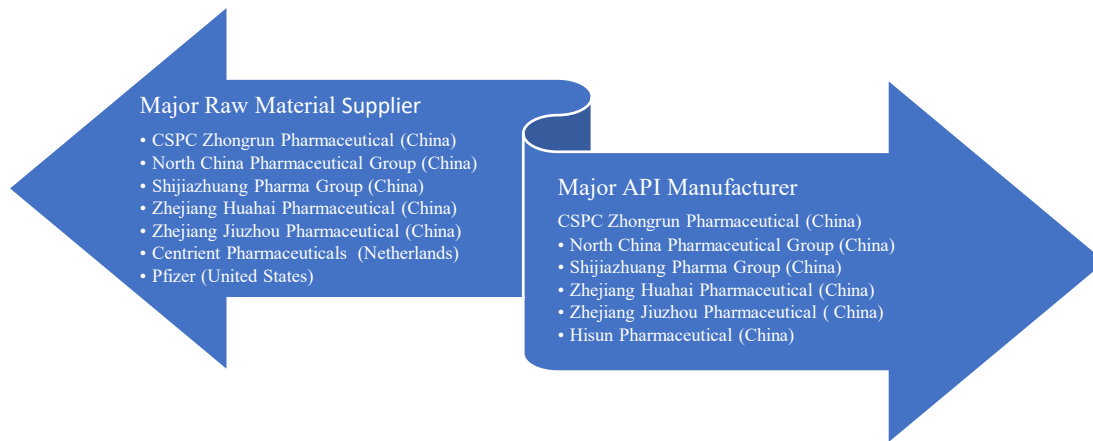


*Source: IMARC Group*

### **Major Suppliers and Manufacturers**

The pharmaceutical supply chain ecosystem comprises four interlinked segments namely – raw material supplier, API manufacturer, distributors and end users that are geographically distributed across regions. Raw material suppliers are largely concentrated in China, such as CSPC Zhongrun Pharmaceutical, North China Pharmaceutical Group, Shijiazhuang Pharma Group, Zhejiang Huahai Pharmaceutical with additional presence in Europe Centrient Pharmaceuticals and Pfizer in the United States. API manufacturers are primarily located in China, with some in Europe and the United States. Sinopharm and Shanghai Pharmaceutical are the top Chinese distributors operating in API supply networks, but their global API distribution network is largely integrated across manufacturing exports and multinational distribution channels rather than centered on one dominant global API distributor. In India, Department of Pharmaceuticals provided a push to domestic manufacturing of critical bulk drugs, Key Starting Material (KSMs), drug intermediate and APIs by launching the Production Linked Incentive (PLI) scheme. Indian firms such as Solara Active Pharma Sciences and Rajasthan Antibiotics Ltd received approvals under PLI scheme for manufacturing of critical APIs such as Penicillin G, Clavulanic Acid etc. Further, end users including pharmaceutical and biotechnology firms, contract research organisations, and contract development and manufacturing organisations are spread across major pharmaceutical hubs such as India, the United States, Europe and parts of East Asia. Figure 3 presents the major raw material supplier and manufacturer of API antibiotics around the world.

*Figure 3: Major Raw Material Supplier and Manufacturer of API Antibiotics*



*Source: Authors adaptation from various industrial reports.*

### **3. Key Antibiotic Classes and Their Therapeutic Uses**

In contemporary medicine, beta-lactams, macrolides, and quinolones are the three main types of antibiotics that are often used. They continue to dominate the market, accounting for most global sales. Penicillins and cephalosporins are examples of beta-lactams, which are highly effective in treating skin, respiratory, and urinary tract infections because they break down the bacterial cell wall. Macrolides, such as erythromycin and azithromycin, are commonly used to treat respiratory infections, particularly in people who are allergic to penicillin. They work by preventing the formation of bacterial proteins. Quinolones (fluoroquinolones), such as ciprofloxacin and ofloxacin, are mostly used to treat severe bacterial illnesses, gastrointestinal infections, and urinary tract infections because they prevent bacterial DNA replication. Because of their wide range of therapeutic uses, these antibiotic classes are essential in both hospital and outpatient treatment systems.

The antibiotics listed include important classes such as rifamycins, fluoroquinolones, tetracyclines, macrolides, penicillins, cephalosporins, and aminoglycosides. These medicines are widely used to treat common infections such as skin infections, stomach and intestinal infections, respiratory illnesses, and urinary tract infections.

Some antibiotics, like vancomycin and clindamycin, are especially important for treating serious infections caused by drug-resistant bacteria. Others, such as streptomycin and rifampicin, are critical for the treatment of tuberculosis, which remains a major public health concern in India. Broad-spectrum antibiotics like doxycycline, azithromycin, and amoxicillin are commonly used in everyday medical care. Certain drugs, including fluoroquinolones and chloramphenicol, are now used less frequently due to problems related to resistance or side effects.

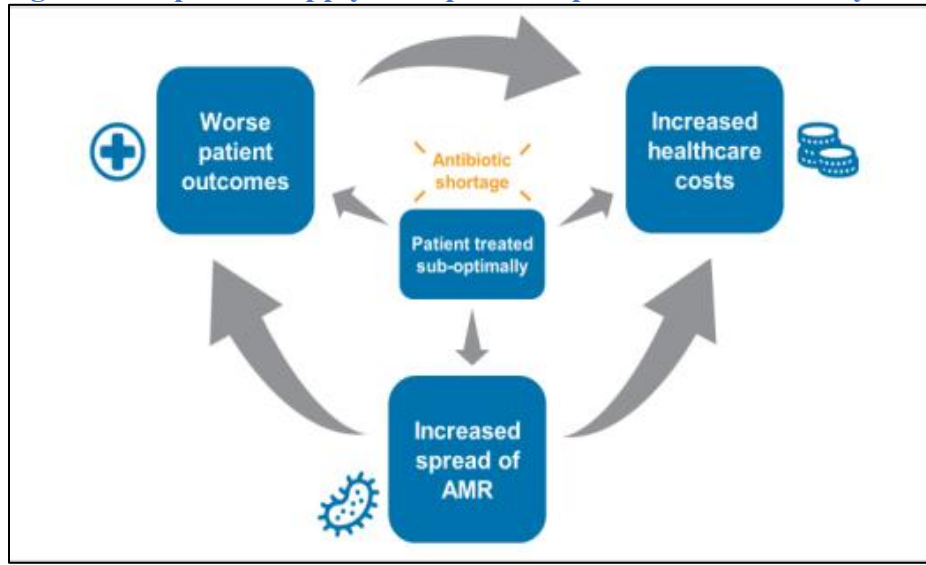
#### **4. Potential Impact of Supply Chain Disruptions**

Any interruption in major manufacturing hubs, such as plant closures, export restrictions, or raw material shortages, can swiftly spread throughout the global market, lowering supply and substantially boosting prices. Logistics and trade frictions, such as port congestion, shipment delays, or restricted export rules, exacerbate supply-side fragility since antibiotics are time-sensitive.

Along with this, shortages place heavy financial and operational pressure on hospitals and health systems, impacting patients. These shortages also lead to unregulated consumption of antibiotics, in terms of intake of broad-spectrum alternatives instead of prescribed medicine. This worsens patient outcomes and increases health system strain.

These interrelated vulnerabilities demonstrate how, despite its efficiency, global antibiotic manufacturing remains very vulnerable to regional shocks. Building redundancy in API supply, diversifying sourcing, and improving regulatory coordination are critical for increasing antibiotic GVC resilience and ensuring global health security (Figure 4). The figure summarises this chain of impacts, showing how a disruption at the manufacturing or API stage cascades into shortages and price spikes, leading to higher costs, constrained treatment options, the accelerating spread of antimicrobial resistance (AMR), and poorer outcomes for patients and health systems.

**Figure 4: Impact of supply disruptions to patients and health systems**



*Source: Authors compilation*

## 5. India's Role in Antibiotics Market, Key Firms and Competitiveness

India plays a critical role in the global antibiotics market as a major manufacturer and supplier of both Active Pharmaceutical Ingredients (APIs) and final formulations. The country's powerful pharmaceutical industry, fueled by its huge generic production capacity and cost competitiveness, has allowed it to emerge as a dependable global supplier. The global exports of antibiotics finished drugs stood at USD 19.92 billion in 2024, where India's exports stood at USD 1.20 billion in 2024, securing 5<sup>th</sup> rank after European Union, Italy, Canada and Switzerland<sup>3</sup> (WITS). India's exports of antibiotics including API, bulk drugs and finished drugs hold a share of 45.84% in India's total global pharmaceutical<sup>4</sup> exports for 2023-2024. Further, India's imports of antibiotics including API, bulk drugs and finished drugs hold a share of 62.13% in India's total global pharmaceutical<sup>5</sup> imports for 2023-2024 (refer Figure 5).

Major Indian pharmaceutical businesses, including Sun Pharma, Cipla, Dr. Reddy's Laboratories, Lupin, Aurobindo Pharma, and Zydus Lifesciences, have large production and export capacities, which are supported by WHO-prequalified facilities and adherence to international regulatory standards.

<sup>3</sup><https://wits.worldbank.org/trade/comtrade/en/country/ALL/year/2024/tradeflow/Exports/partner/WLD/product/300420#>

<sup>4</sup> Pharmaceuticals include HS 2941 and chapter 30.

<sup>5</sup> Pharmaceuticals include HS 2941 and chapter 30.

India's competitive advantages derive from its large-scale industrial infrastructure, competent labor, low production costs, and extensive knowledge of chemical synthesis and formulation technologies. Furthermore, India's wide network of middle and small businesses supports large corporations by providing intermediates and specialist compounds. However, various systemic problems limit India's antibiotic sector. One major problem is its reliance on imported raw materials and APIs, notably those from China, for important intermediates used in penicillin and cephalosporin manufacturing. This dependence makes the industry vulnerable to supply disruptions and pricing volatility.

Furthermore, occasional quality-certification issues, compliance expenses, and regulatory delays all have an impact on entry to highly regulated markets like the EU and the United States.

### **India's End-User Segments**

Beyond its role as a major producer and exporter, India is also a rapidly growing consumer market for antibiotic APIs, with several distinct end-user segments. Pharmaceutical manufacturers, both branded and generic, form the largest segment, purchasing APIs in bulk and converting them into finished dosage forms such as tablets, capsules, syrups and injectables.

Contract manufacturing organisations (CMOs/CDMOs) are a second key segment, producing APIs and providing development, scale-up and regulatory services for domestic and global pharmaceutical companies. India's CMO/CDMO sector is expanding rapidly on the strength of its cost advantages, regulatory experience and large-scale technical capacity, competing with global players such as Lonza, Catalent and WuXi AppTec.

India's contract-manufacturing base spans firms ranked among global leaders such as Divi's Laboratories, Aurobindo Pharma, Lupin and Syngene International down to a wide network of small and medium enterprises. These SMEs produce low-volume or region-specific generics for state procurement, rural markets and emerging export destinations, adding significantly to the resilience and geographic spread of India's antibiotic manufacturing.

Smaller but growing segments include veterinary medicine, where antibiotics are widely used in livestock, poultry, aquaculture, and companion animals, and research users such as biotech start-

ups and CROs, which procure high-value quantities of APIs for R&D and new formulation development.

## 6. India's Antibiotics Trade Profile and Dependencies

As India is globally competitive in the pharmaceutical sector, there are some key inputs that are important to build manufacturing capabilities and remain cost competitive. But India is import dependent for its supply. The codes for such antibiotics are identified separately for API/bulk drugs and finished drugs (Table 1). It is noted that China is the major supplier of these key antibiotics. Italy, USA and Mexico are alternate suppliers of these key inputs. Penicillins and derivatives are the largest imported input followed by Erythromycin.

**Table 1: Imports and Top Supplier of Antibiotics (USD Million, 2023-2024)**

HS 6-digit Codes	Product Description	Usage	India's Import Dependency on China (%)	Major Supplier	Trade Balance	India's avg. import from China	India's avg. import from World
294110	Penicillins and derivatives	Treatment of respiratory tract infections, skin and soft tissue infections, widely used in primary healthcare.	87.6	China, Italy	-489.8	685.3	782.3
294120	Streptomycins	Used mainly for tuberculosis, plague; important in combination therapy for drug-resistant infections.	75.3	China	-7.3	5.5	7.3
294130	Tetracyclines	Broad-spectrum use for respiratory infections, acne, cholera, zoonotic diseases, and malaria prophylaxis.	49.5	China, Italy	-59.1	30.6	61.8
294140	Chloramphenicol	Reserved for severe infections such as typhoid fever, meningitis, and serious eye infections	96.4	China, Spain	0.5	2.7	2.8
294150	Erythromycin and other macrolides	Used for respiratory and skin infections, especially in patients allergic to penicillin	94.2	China, USA	-52.3	151.7	161.1
294190	Other antibiotics, rifampicin and its salts	Includes rifampicin, vancomycin, fluoroquinolones, etc.; used for tuberculosis, hospital-acquired infections	84.4	China, USA	-310.7	796.7	943.8

HS 6-digit Codes	Product Description	Usage	India's Import Dependency on China (%)	Major Supplier	Trade Balance	India's avg. import from China	India's avg. import from World
300320 <sup>6</sup>	Medicaments containing antibiotics (not in retail packs)	Supplied in bulk to hospitals and public health systems for large-scale treatment programs and institutional use.	100.0	China, Mexico	-7.8	14.1	14.1
300420	Medicaments containing antibiotics (retail sale) <sup>7</sup>	Finished dosage forms such as tablets, capsules, and injections.	4.7	China, USA	944.7	2.5	53.6

Source: Authors Compilations

In antibiotic category, India's average global import of APIs/Bulk Drugs stood USD 1973.26 million where USD 1686.60 million imports from China (refer Table 2). On the other hand, India's API average global exports stood at USD 1046.78 million. This indicates that India has negative trade balance in API/Bulk Drugs category for 2023-2024.

**Table 2: India's Antibiotics Trade (2023-2024, USD Million)**

Category	India's avg. imports from China	India's avg. imports from World	Trade Balance
API/bulk drugs	1686.60	1973.26	-926.49
Finished Drugs	2.48	53.58	944.70
Total Antibiotics	1689.08	2026.84	18.21
Total Pharmaceuticals*	1773.50	3262.38	1198.82

Source: Authors calculations from DGCIS data, Note: \* includes HS 2941 and Chapter 30

Despite impressive pharmaceutical export performance, India's API (bulk medicines) trade balance is still fundamentally negative due to a large reliance on imports. Further, China is the main source of APIs, especially for antibiotics, vitamins, and essential intermediates, and imports regularly outpace exports. Due to this concentration of imports, India is vulnerable to external shocks and supply-chain vulnerabilities. Given that India exports some APIs, like anti-

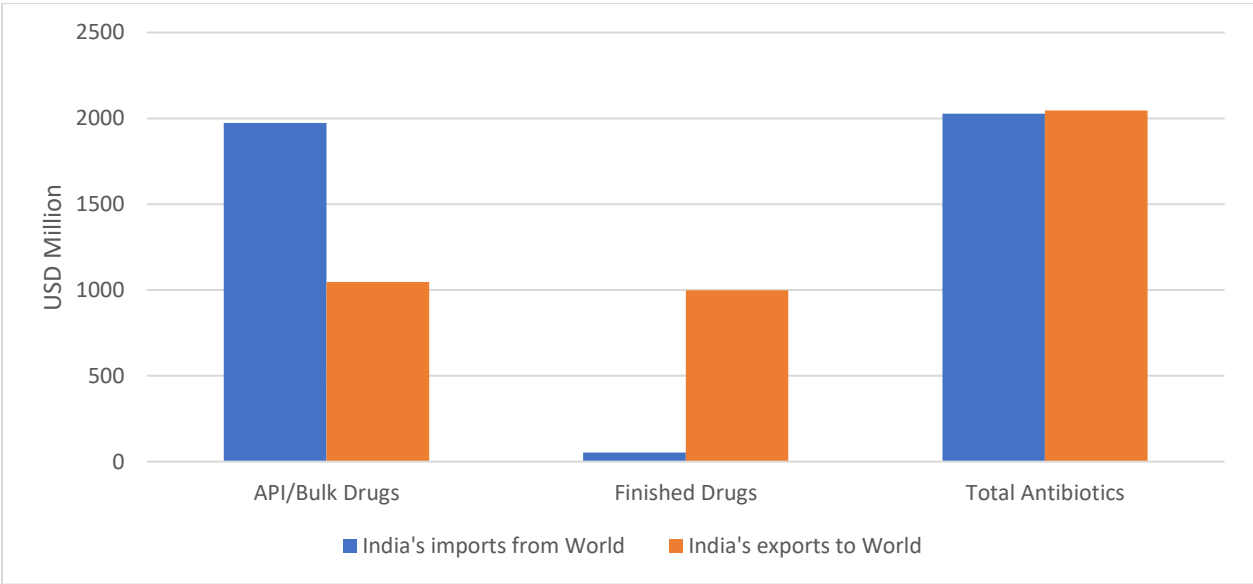
<sup>6</sup> This comprises medicaments consisting of two or more ingredients that have been combined for therapeutic or prophylactic applications, not set up in standardized quantities or in forms or packings for retail sale, and contain antibiotics. This description is consistent with the notion of bulk drugs or drug intermediates in several instances, as the commodities are packaged in bulk and are not ready for direct retail sale.

<sup>7</sup> This indicates finished antibiotics drugs for direct dosing.

inflammatory, anti-diabetic, and cardiovascular medications, these exports are not enough to offset import levels. Due to restricted economies of scale, energy costs, and environmental compliance, domestic API manufacturing has economic constraints that limit import substitution.

On the contrary, India has surplus trade balance in finished drugs category for the same period (refer Table 2). The reason behind this is India’s high competitiveness and scale in the production of Generic medicine, leading to significant global exports in finished drugs category. Even though deficit in Antibiotics trade is very low, a closer look at the two components, namely APIs and finished goods, reveals a contrasting picture. In the API segment, India’s imports from the world are almost 47 per cent higher than its exports, indicating a significant deficit in APIs. In contrast, in finished drugs, India’s exports to the world are sufficiently higher than its imports, reflecting a substantial surplus in finished formulations. The surplus in finished drugs offsets the deficit arising in APIs, resulting in an almost complete neutralisation of trade in total Antibiotics, where exports marginally exceed imports (Figure 5). Figure 5 illustrates India’s trade in antibiotics market (2023-2024). API/Bulk drugs have greater imports than finished drugs. The underlying reason of the deficit in antibiotics trade is the distinct attributes and applications of API and finished drugs.

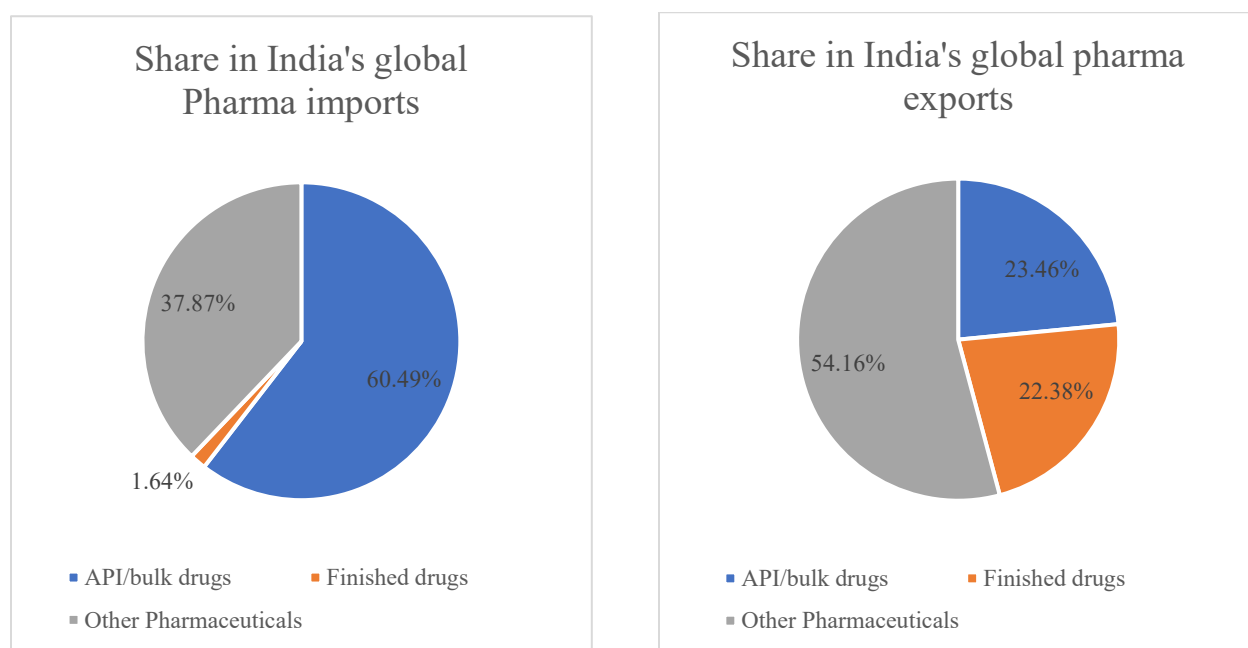
**Figure 5: India’s Antibiotics Trade (USD Million, 2023-2024)**



Source: Authors calculations from DGCIS data

Figure 6 presents share of antibiotics in India’s total pharmaceuticals imports and exports for 2023-24. Out of total pharmaceuticals, share of antibiotics stands 62.13% in India’s global pharmaceuticals imports. This indicates that antibiotics has high share in pharmaceuticals imports, and has substantial intake in India. In context of India’s pharmaceuticals exports, antibiotics hold a share of 45.84%, where API/Bulk drugs have marginally more share than finished drugs in India’s global pharmaceuticals exports.

**Figure 6: Share of Antibiotics in India’s Global Pharmaceuticals\* Imports and Exports (2023-2024)**



Source: Authors calculations from DGCIS data, Note: \* includes HS 2941 and Chapter 30

There is significant dependency on China for the import of APIs in drug manufacturing in India. Further, a total of 16 HS 8-digit code of antibiotics API are identified with more than 80% dependency on China as a source of imports (Table 3). This is a concern for India.

**Table 3: List of 16 Antibiotic API with more than 80 Percent Dependency on China (USD Million, 2023-2024)**

HS Codes	Commodity Description	India's import from China	India's import from World	Top Import Source
29412010	Streptomycins	3.675	3.675	China
29419013	Rifa Or Rifa S Sodium (Rifaint)	9.155	9.155	China
29419040	Gentamycin And Its Salts	8.32	8.335	China
29413020	Tetracycline/Oxytetracycline And Hr Salts	10.265	10.3	China
29419060	Norfloxacin And Its Salts	6.085	6.135	China
29419050	Neomycin	3.47	3.515	China
29419030	Ciprofloxacin And Its Salts	9.05	9.19	China
29414000	Chloramphenicol And Its Derivatives	2.67	2.76	China
29415000	Erythromycin And Its Derivatives	151.71	161.085	China
29411050	6 - Apa	404.07	429.605	China
29411030	Amoxicilline And Its Salts	43.34	48.095	China
29419011	Rifampicin	17.51	19.575	China
29411020	Ampicilline And Its Salts	0.84	0.945	China
29419090	Other Antibiotics	694.775	790.54	China
29419014	1 - Amino -4 - Methyl Piperazine (Rifaint)	0.035	0.04	China
29411010	Penicillins And Its Salts	188.49	232.885	China

*Source: Authors' Calculation from DGCIS data*

## 7. Insights using ASI Data

In order to understand the domestic production capacity of India in antibiotics market and assess India's readiness in times of supply shocks, an attempt is made to understand this scenario using Annual Survey of Industries (ASI) data. For this purpose, 36 HS 8-digit codes related to antibiotics under Chapters 29 and 30 were identified and mapped to NPCMS codes (refer Table 1A).

The exercise of mapping 36 HS 8-digit codes resulted in 24 unique NPCMS codes, for which production data has been analysed to evaluate India's dependency of foreign source (Table 1B). For these 24 NPCMS codes, India's ex-factory value of quantity manufactured has been analysed

for the period 2018-19 to 2023-24. Seven NPCMS codes with higher import to production ratio were identified as highly critical (Table 4). Further, vulnerability to supply-chain disruptions is assessed for the identified 7 NPCMS codes focusing on their input structure and dependence on imported inputs.

The inputs imported for the purpose of manufacturing these 7 NPCMS products were further traced through ASI database. Although ASI data does not show how much input goes into making each product, it reports inputs and outputs separately without a direct link. From the supply chain resilience perspective, the analysis attempted to capture the inputs imported by firms for manufacturing these 7 NPCMS codes. Table 4 presents import-output ratio for India's average global imports from world and average ex-factory value of quantity manufactured for 2021-2024.

**Table 4: India's Import from World, Ex-factory value and Import-Production Ratio (Average, 2021-2024, USD Million)**

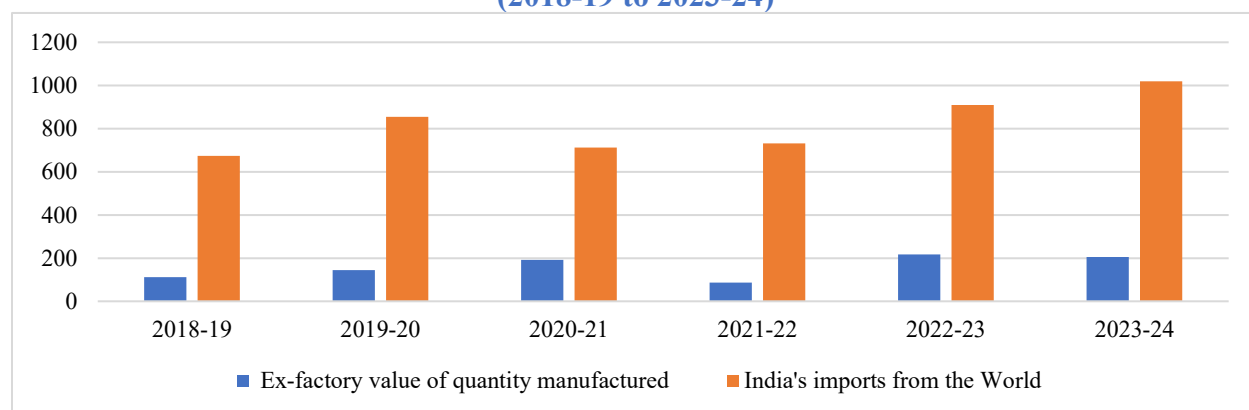
Product Code NPCMS	NPCMS Description	India's imports from the World	Ex-factory value of quantity manufactured	Import/Production Ratio (Global/domestic)
3525069	Penicillins & preparations thereof, n.e.c.	406.08	1.51	268.91
3525045	Gentamicin / neomycin	10.83	0.90	12.08
3525068	Penicillin	196.20	0.83	236.38
3525079	Streptomycin	8.36	3.30	2.53
3525030	Doxycycline / minocycline	28.04	7.61	3.68
3525040	Ethambutol/isoniazid/pyrazinamide/rifampicin (m.d.t for t.b) single or composition	105.86	68.94	1.54
3525037	Erythromycin	139.65	89.77	1.56

Source: Authors calculations from DGCIS and ASI data

For the identified highly-critical antibiotics, the comparison of India's ex-factory value of quantity manufactured with imports from the world reveal an increasing dependence on imports over the period 2018-19 to 2023-24. Domestic output for the identified 7 key APIs increased from USD 112 million in 2018-19 to USD 205 million in 2023-24, though it reflected considerable volatility, particularly a sharp decline in 2021-22, followed by a recovery in subsequent years. In contrast, India's imports of the corresponding antibiotics remained consistently high and increased over the period, rising from USD 674 million in 2018-19 to USD 1,019 million in 2023-24. Imports exceeded domestic output by a significant margin in every year, indicating that the increases in

domestic production have not been sufficient to offset India’s reliance on foreign suppliers (Figure 7). While the present analysis is subject to a sample effect, as it focuses only on the 7 identified highly-critical APIs rather than the antibiotics sector as a whole, the findings remain significant from a supply-chain resilience perspective. The selected APIs represent the most import-dependent and strategically vulnerable segment of the sector; therefore, persistent reliance on imports in these products indicates continuing external dependency in critical antibiotic value chains.

**Figure 7: India’s Domestic Production and Global Imports of Antibiotics (USD million) (2018-19 to 2023-24)**



Source: Authors calculations from ASI and DGCI&S data

Following the detailed methodology presented above, a set of imported inputs are identified that are critical to the domestic production of antibiotics. As there is no strict one-to-one relationship between inputs and outputs, the analysis of input-output linkages needs to be undertaken with caution. This is because a single production unit manufactures a wide range of products using the same set of imported input, often in varying quantities and volumes. As a result, an imported input may support the production of multiple finished formulations, making it difficult to directly map a specific imported input to a single output.<sup>8</sup>

<sup>8</sup> In 2022-23, for instance, NPCMS 3525069 (Penicillin & preparations thereof) is being produced in 4 DSLs, which together are producing approximately 30 additional products. Similarly, NPCMS 3525045 (Gentamicin / neomycin) is produced across 3 DSLs, collectively manufacturing around 28 products. NPCMS 3525079 (Streptomycin) is produced in a single DSL, with a total of about 7 other products. In the case of NPCMS 3525030 (Doxycycline / minocycline), production is spread across 7 DSLs, which together produce approximately 59 additional products. NPCMS 3525040 (Ethambutol/isoniazid/pyrazinamide/rifampicin for tuberculosis, single or in combination) is also manufactured in 7 DSLs, with around 49 other products being produced. Likewise, NPCMS 3525037 (Erythromycin) is produced across 7 DSLs, which together account for about 48 additional product.

For the above identified 7 critical NPCMS, these inputs include antifungal agents such as miconazole, clotrimazole and ketoconazole; cephalosporin antibiotics including cefalotin, cefaclor, cefprozil, cefadroxil and key antibiotics such as erythromycin, ciprofloxacin, doxycycline, minocycline and penicillin. In addition, certain anti-leprosy formulations and other pharmaceutical products are also imported as essential inputs. The import basket further includes chemical and allied substances, including specific inorganic chemicals and chemical elements, which serve as intermediates or processing inputs in pharmaceutical manufacturing.

### **Supply Chain Aspect of Selected Products**

The NPCMS based linkages provides an assessment of value addition at product-factory level. Increased output value to input value ratios are considered as indicator to more intense processing, upgrading, or transformation within that product category. This product-level mapping provides information about domestic value creation in manufacturing and informs discourse on industrial upgrading, backward linkages, and Indian manufacturing businesses' capacity to move up the value chain.

At first, units manufacturing the selected NPCMS codes are identified and the same units are looked for their purchase value of their inputs/raw material. Table 5 provides NPCMS-based linkage between value of imported inputs and ex-factory output values highlighting substantial domestic value addition in India's antibiotic API sector. For key products such as ciprofloxacin, erythromycin, doxycycline/minocycline, and cephalosporins, ex-factory values are consistently many times higher than corresponding input purchases, indicating that production relies on firm-level synthesis, fermentation, and complex processing rather than simple repackaging of imported inputs. This confirms that India's API industry remains structurally value-creating, with strong technological and process capabilities at the product level<sup>9</sup>.

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<sup>9</sup> HS 8-digit antibiotic API products identified as highly import-dependent were first mapped to corresponding NPCMS product codes. Thereafter, manufacturing units (DSLs) producing these NPCMS codes were identified from the ASI database. For the identified DSLs, the inputs/raw materials used in the production process and their corresponding NPCMS codes were identified in order to capture backward production linkages relevant to the selected critical products. Since these inputs are used in the production of the identified critical NPCMS products, ex-factory output values of such inputs were obtained from Block J, while the value of imported inputs was obtained from Block I of the ASI schedule. The comparison of imported input values with ex-factory output values was used to assess the extent of domestic value addition embodied in the production process.

A notable post-2021 pattern is the upgrading and revival of specific antibiotic segments, particularly macrolides such as erythromycin, where output values rise sharply without a commensurate increase in input costs. This suggests improvements in process efficiency, scale, and capacity utilization, likely reinforced by policy support aimed at reducing import dependence. Cephalosporins also show a recovery in output after pandemic disruptions, reflecting improved access to intermediates and a gradual strengthening of domestic backward linkages within beta-lactam value chains (refer Table 1C).

**Table 5: Ex-factory value of quantity manufactured and Value of imported inputs in USD Million (Average 2022-2024)**

NPCMS	Description	Ex-factory value of quantity manufactured	Value of imported inputs
3549099	Chemical & allied substance & products n.e.c	1944.87	667.69
3423199	Chemical elements n.e.c.; inorganic acids except phosphoric, nitric and sulphonitic; inorganic oxygen compounds of boron, silicon and carbon; halogen or sulphur compounds of non-metals; sodium hydroxide; hydroxide and peroxide of magnesium; oxides, n.e.	1468.5	601.66
3527099	Other pharmaceutical products n.e.c	13445	295.13
3525037	Erythromycin	68.94	36.88
3525068	Penicillin	0.82	31.23
3525030	Doxycycline / minocycline	6.91	14.72
3527042	Miconazole / clotrimazole / ketoconazole etc anti fungals	321.47	9.22
3525028	Dapsone with /out rifampicin (anti leprosy)	79.68	9.15
3525014	Cefadroxil / cephalexin / cefazolin	55.36	6.79
3525015	Cefalotin/cefalothin/cefaclor/cefprozil	41.58	2.96
3525023	Ciprofloxacin	192.13	1.65

Source: Authors calculations from ASI data

At the same time, Table 5 highlights the extent of import dependence across selected NPCMS categories by comparing the ex-factory value of quantity manufactured with the value of imported inputs. It reveals that a high share of imported inputs is indicative of a higher risk to the resilience of the domestic supply chain. Chemical and allied substances and chemical elements and inorganic chemicals show high values of imported inputs alongside substantial domestic production. Among pharmaceutical products, other pharmaceutical products n.e.c. (NPCMS 3527099) record a high

ex-factory value with comparatively lower imported inputs, suggesting stronger domestic production. In contrast, certain antibiotics such as penicillin and doxycycline/minocycline exhibit imported input values that are higher than their ex-factory production. Other antibiotics, including erythromycin, cephalosporins, ciprofloxacin, antifungals and anti-leprosy formulations, also depend on imported inputs, though at relatively lower absolute levels. Overall, the pattern highlights continued dependence on imported inputs for several critical antibiotics.

## **8. Policy Implications and Way Forward**

The evidence is stark: for India's seven most critical antibiotic APIs, the gap between imports and domestic production has widened steadily since 2018-19, with imports now far outstripping what is produced at home. Reducing this dependence is the central objective of the measures set out below. It is necessary to enhance domestic production of antibiotic API for a resilient supply chain in the antibiotic market.

Encouraging Indian production of essential APIs through fiscal and regulatory initiatives is crucial. Some additional measures like output linked subsidies, low-cost loans, and public-private partnerships can provide stimulus to enhanced domestic production and reduced dependence on imports. Secondly, creating ecosystem to support firms in meeting global quality and regulatory standards is necessary to remain competitive. Compliance with standards such as GMP, WHO pre-qualification and EU/US regulations is essential to ensure access to high-value export markets. Many small and medium enterprises need some capacity building programme well designed for them with technical aid, regular monitoring and timely grievance redressal etc.

The COVID-19 pandemic has indicated that India needs to maintain limited stockpiles for clinically important antibiotics with supply risks to prevent shortages during health emergencies, geopolitical tensions or trade restrictions. The stockpiles need to be regularly assessed to meet any uncertainty. Measures linking buffer stocks with public procurement systems should be built to avoid market volatility and ensure a stable supply. This will act as a cushion and help in avoiding sudden price spikes while maintaining affordability and accessibility of key antibiotics. Some rejuvenated trade facilitation measures need to be embraced to improve the trade balance. It is

necessary to facilitate the import of raw materials while supporting the export of finished medicines. It is equally necessary to avoid strict export bans that could disrupt global supply chains.

Overall, the NPCMS-linked evidence reveals that India's antibiotic API sector contributes significantly to domestic value addition. Recent increases in macrolides and cephalosporins suggest technological advancement and capacity revival, aided by greater upstream links. However, continuing shortcomings in fermentation-intensive APIs like penicillin emphasize the importance of specific governmental assistance for upstream chemicals and fermentation infrastructure. India has strengthened domestic capacity in Antibiotic API, but still dependent on import for some key APIs like penicillin.

Though, India is globally competitive in pharmaceutical sector and enjoys substantial exports in finished drugs. But the dependence on China for key raw material supplies indicates for urgent targeted policy intervention to build domestic manufacturing capacities, diversify import sources and improve supply chain resilience. As said earlier, fiscal support, regulatory assistance and strategic stockpiling along with sound public procurement mechanism can provide stable ecosystem and ensures sustained supply of these key antibiotics. The policy support such as Production Linked Incentive (PLI) scheme and Bulk Drug Parks is well designed to enhance domestic manufacturing capabilities and thereby improve the API trade balance in medium to long term.

## Annexure

**Table 1A: Text Mapping of HS Codes with NPCMS Codes**

HS Code and Description	NPCMS Code	NPCMS Description
Amoxicilline And Its Salts (29411030); Ampicilline And Its Salts (29411020); Cloxacilline And Its Salts (29411040)	3525007	Amoxicillin / ampicillin with /out cloxacillin
Azithromycin (30042064)	3525010	Azithromycin
Cephalexin And Its Salts (29419020)	3525014	Cefadroxil / cephalexin / cefazolin
Other Cephalosporins And Their Derivatives (30042019)	3525019	Cephalosporins & preparations thereof, n.e.c.
Chloramphenicol And Its Drvtvs Slts Thereof (29414000)	3525020	Chloramphenicol
Ciprofloxacin- In Capsul,Tblts Form Etc (30042013); Ciprofloxacin (Fluoroquinolones)-30042033; Ciprofloxacin And Its Salts (29419030); Other Fluoroquinolones (30042039)	3525023	Ciprofloxacin
Clarithromycin (30042063); Clindamycin (30042095)	3525024	Clindamycin/lincomycin/clarithromycin
Doxycyclime And Its Salts (29413010)	3525030	Doxycycline / minocycline
Erthromycin And Its Drvtvs Slts Thereof (29415000)	3525037	Erythromycin
Rifampicin (29419011); Other Rifampicin And Its Salts (29419019); Rifa Or Rifa S Sodium (Rifaint) (29419013); 1 - Amino -4 - Methyl Piperazine (Rifaint) (29419014)	3525040	Ethambutol/isoniazid/pyrazinamide/rifampicin (m.d.t for t.b)single or composition
Gentamycin And Its Salts (29419040); Neomycin (29419050)	3525045	Gentamicin / neomycin
Vancomycin (30042096)	3525050	Imipenem / sylastacin /vancomycin
Other Macrolide (30042069)	3525054	Macrolides & preparations thereof, n.e.c.
Norfloxacin And Its Salts (29419060)	3525056	Metronidazole / tinidazole with/out norfloxacin
Ofloxacin (30042034)	3525064	Ofloxacin / pefloxacin

HS Code and Description	NPCMS Code	NPCMS Description
Tetracycline/Oxytetra - Cycline And Hr Salts (29413020)	3525065	Oxytetracycline / tetracycline
Penicillins And Its Salts (29411010)	3525068	Penicillin
Other Penicillins And Thr Drvtvs Wth A Penteillianic Acid Strctr Slts Thereof (29411090); 6-Aminopenicillanic Acid (29411050)	3525069	Penicillins & preparations thereof, n.e.c.
Streptomycins (29412010); Other Streptomycine And Drvtvs, Salts (29412090)	3525079	Streptomycin
Sulfonamides And Cotrimoxazole (30042020)	3525083	Sulfonamides & preparations thereof, n.e.c.
Tetracycline/Oxytetra - Cycline And Hr Salts (29413020); Other Tetracyclines And Thr Drvtvs Slts (29413090)	3525084	Tetracyclines & preparations thereof, n.e.c.
Other, Containing Antibiotics (30032000); Other Antibiotics (29419090)	3525099	Antibiotics & preparations thereof, n.e.c.
Othr Medicament Containing Othr Antibioticand Put Up For Retail Sale (30042099)	3526099	Medicaments, for therapeutic or prophylactic uses n.e.c

Source: Authors mapping using HS and NPCMS classification

**Table 1B: India's Import from World, Ex-factory value and Import-Production Ratio (Average, 2021-2024, USD Million)**

Product Code NPCMS	NPCMS Description	HS Code	Product Description	Ex-factory value of quantity manufactured	India's imports from the World	Import/Production Ratio (Global/domestic)
3525069	Penicillins & preparations thereof, n.e.c.	29411090; 29411050	Other Penicillins And Their Drvtvs Wth A Penteillianic Acid Strctr Slts Thereof; 6-Aminopenicillanic Acid	1.51	406.08	268.91
3525045	Gentamicin / neomycin	29419040; 29419050	Gentamycin And Its Salts; Neomycin	0.90	10.83	12.08
3525068	Penicillin	29411010	Penicillins And Its Salts - Penicillin G	NA	196.20	NA

Product Code NPCMS	NPCMS Description	HS Code	Product Description	Ex-factory value of quantity manufactured	India's imports from the World	Import/Production Ratio (Global/domestic)
3525079	Streptomycin	29412010; 29412090	Streptomycins; Other Streptomycine And Drvtvs, Salts	NA	8.36	NA
3525030	Doxycycline / minocycline	29413010	Doxycyclime And Its Salts	7.61	28.04	3.68
3525040	Ethambutol/isoniazid/pyrazinamide/rifampicin (m.d.t for t.b)single or composition	29419011; 29419019; 29419013; 29419014	Rifampicin; Other Rifampicin And Its Salts; Rifa Or Rifa S Sodium (Rifaint); 1 - Amino -4 - Methyl Piperazine (Rifaint)	68.94	105.86	1.54
3525037	Erythromycin	29415000	Erthromycin And Its Drvtvs SIts Thereof	89.77	139.65	1.56

Source: Authors calculations using ASI and DGCI&S data

**Table 1C: Ex-factory value of quantity manufactured and Purchase value in USD Million (FY 2018-19 to 2023-24)**

NPCMS	Description	Ex-factory value of quantity manufactured						Purchase value					
		FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24
3527042	Miconazole / clotrimazole / ketoconazole etc anti fungals	398.79	171.18	0	278.76	297.67	387.98	0.55	0.31	47.81	16.16	5.61	5.89
3527099	Other pharmaceutical products n.e.c	8169.60	10808.88	0	14611.62	11684.26	14039.12	344.49	199.26	259.22	315.05	249.90	320.45
3525015	Cefalotin/cefalothin/cefaclor/cefprozil	107.10	155.27	39.54	34.05	37.33	53.36	-	-	-	1.97	6.64	0.28
3525014	Cefadroxil / cephalixin / cefazolin	287.47	103.62	217.24	30.58	45.74	89.76	3.64	2.19	6.15	7.64	4.92	7.81
3549099	Chemical & allied substance & products n.e.c	1100.23	1715.56	0.00	2274.39	1538.20	2022.02	455.28	508.71	608.17	561.10	708.87	733.11
3525028	Dapson with /out rifampicin (anti leprosy)	133.85	79.93	55.66	55.08	72.34	111.62	3.76	12.82	15.92	11.71	3.77	11.96
3525037	Erythromycin	18.99	25.05	35.38	26.25	32.27	148.29	20.45	27.10	33.03	48.62	34.48	27.53
3525023	Ciprofloxacin	170.00	116.25	163.22	221.85	143.66	210.88	0.36	3.06	2.59	1.43	1.76	1.77
3525030	Doxycycline / minocycline	14.63	13.93	65.26	1.63	11.05	8.05	23.13	11.38	20.00	19.42	12.95	11.80
3423199	Chemical elements n.e.c.; inorganic acids except phosphoric, nitric and sulphonitric; inorganic	784.67	402.56	-	1351.08	1616.00	1438.41	182.88	129.54	474.02	628.34	634.94	541.71
3525068	Penicillin	1.53	10.60	1.17	-	-	2.47	51.70	2.72	3.26	82.59	5.48	5.62

Source: Authors calculations using ASI data

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India's foreign trade policy (FTP) statement 2015-20 suggested the creation of a global institution to provide a counter-narrative on key trade and investment issues from the perspective of developing countries such as India. To address this, a new institute, the Centre for Research on International Trade (CRIT), was established in 2016. CRIT's vision and objective were to significantly deepen existing research capabilities and broaden them to encompass new and specialised areas amid the growing complexity of globalisation and its spillover effects on domestic policymaking. Secondly, enhancing the capacity of government officers and other stakeholders in India and other developing countries to deepen their understanding of trade and investment agreements.

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