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ANTIBIOTIC DRUG APPLICATION IN RAJASTHAN STATES: EVIDENCES FROM PHARMACEUTICAL SOURCE AND INTAKE

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Abstract:

An objective of ongoing activities in various different Indian states is to provide healthcare for all of India's population. The state of Rajasthan undertook a significant initiative in 2011 to ensure that all residents had access to critical medications. The program's pharmaceutical supply chain is built on distributed distribution and centralised antibiotic drug procurement. The system has made great headway toward all three principles of universal health care in a short period of time. The impact of increasing access to life-saving pharmaceuticals in Rajasthan, an Indian state with a population of more than 70 million, is one of the paper's main concerns. Using a multistage random selection technique (RST), primary data from 120 publicly funded healthcare facilities were gathered for this investigation. Additionally, the National Sample Survey Organization's statistics and health data were evaluated. The new administration added further requirements, but these were received with a great deal of opposition.

Keywords: Pharmaceutical sources, antibiotic drugs, healthcare, RST, bacterial infections

1. Introduction

Antimicrobial drugs, such as antibiotics, are crucial for treating and preventing bacterial infections. They may prevent the growth of bacteria or kill them off. Even fewer medications work against protozoa (Aminov, 2017). Because antibiotics are ineffective against viruses like the common cold and the flu, and because they can have unpleasant side effects if administered incorrectly, they are rarely prescribed for such illnesses. Infectious diseases like tuberculosis were nearly wiped out of existence in the industrialised world thanks to the introduction of antibiotics and vaccinations in the 20th century. Unfortunately, overuse, especially in animal husbandry, of these drugs has led to the emergence of bacterial strains that are resistant to them (Blaser, 2021). According to the

World Health Organization, antimicrobial resistance is "occurring right now in every region of the world and has the potential to affect everyone, of any age, in any country."

The Government of India and the Rajasthan State Industrial Development & Investment Corporation Limited each contributed Rs. 4.98 crores toward the paid-up equity capital of the Joint Sector Central Public Sector Unit Rajasthan Drugs and Pharmaceuticals Limited (RDPL). Although the business was established in 1978, it wasn't until 1981 that production was launched to the public. The company's factories and corporate headquarters are located on Road No. 12 in Jaipur's VKI Industrial Area (Becker, 2018).

Pharmaceuticals in various forms, including tablets, capsules, liquid orals, ORS powder, and eye drops, are manufactured in this Schedule 'M' compliant plant (Felicetti, 2017). Modern laboratory equipment, including High Performance/Pressure Liquid Chromatography (HPLC), Fourier Transform Infrared Spectroscopy (FTIR), etc., is the responsibility of the company's quality management team.

To secure RDPL's long-term viability, the government severed ties with Indian Drugs & Pharmaceuticals Ltd. (IDPL) in August 2010 by purchasing IDPL's interests in the company. Through the purchase of new machinery and the provision of appropriate training to its employees, the Company has enhanced its capacity for manufacture (Fiers, 2017). The corporation has shifted its marketing strategy to take on the few Public Sector competitors that have survived the recent economic downturn while remaining profitable. Currently, it seems to be growing at a rate that can be maintained (Felicetti, 2017).

The trustworthiness and high quality of the company's products have helped it gain a strong reputation among Indian businesses. The Aminov, (2017) scheme was created by the Government of India to guarantee that all Indians could afford to buy generic (unbranded) medications of adequate quality. The company takes great satisfaction in its participation as a vital partner in this creative and noble endeavour (Araujo, 2016).

Pharmaceuticals made by the company include antibiotics, antimalarials, NSAIDs (nonsteroidal anti-inflammatory drugs), antacids, analgesics, anti-pyretics, cough expectorants, cardio-diabetic medications, anti-allergic medications, anti-bacterial medications, anti-fungal medications, vitamins, minerals, ophthalmic preparations, and Oral Rehydration Salt (ORS). In order to boost its market share and profitability, the company is branching out into untapped niches like the veterinary industry and Ayurvedic and other traditional Indian treatments (Lewis, 2017).

2. Literature review

Blaser, et al., (2021), examine about the impact of AMR on ecosystems and application of antibiotic drugs was generally disregarded. The threat to India's environment from AMR is growing, thus the country must act quickly to contain the epidemic. In order to find a solution, we need to assemble experts from many fields and have they worked together, coordinating their efforts under a single manager. India's pharmaceutical business is highly competitive, and its products are of the highest quality available.

Becker, et al., (2018), study about pharmaceutical companies released wastewater containing ciprofloxacin at concentrations of 28 and 31 mg/l on two separate days in 1951. When these numbers are extrapolated to the overall amount of sewage produced, it becomes clear that many kilogrammes of antibiotics are being discarded daily. Some antimicrobials, like the fluoroquinolones and sulphonamides, leave behind stable residues, while others, like the beta-lactams, disintegrate rather quickly.

Murray, et al., (2022), addressed the human and economic costs of antibiotic resistance continue to concern public health experts. Health services in a number of countries, including India's, have developed strategies to slow the disease's progress. Animals, food, and the natural world are just as important as humans when it comes to combating AMR. The full Indian perspective on the One Health movement is explored here. The prevalence of antibiotic resistance is very high in India. The genes or organisms of resistant species have also been detected in the wild, most notably in water systems.

Newman, et al., (2016), addressed about unanticipated pharmacological effects are frequently discovered during patient treatment (such as a side effect or therapeutic effect unrelated to the primary indication). The desire to learn more about an unexpected result can lead to a revaluation of a previously studied drug. Reevaluation within T1-T3 is desirable, although the majority of these therapeutically essential problems require basic scientific research.

Sethi, et al., (2021), explain the success rate for new compounds in the conventional drug discovery and development process is notoriously poor. Drug repurposing, a form of reverse translation, greatly improves this likelihood. The term “medicine repurposing” refers to a method of increasing a drug's effectiveness by drawing on existing scientific information, in this case usually human clinical data.

Felicetti, et al., (2017), his research evidence of the pharmaceutical industry's significance to health care in Europe may be seen in the region's consistently robust pharmaceuticals market. Pharmaceuticals, both in their active medicinal component form and as metabolites or other transformation products, can pollute the environment at any point in their life cycle, from production through disposal. Recent research has shown that individual consumer behaviour is causally linked to pharmaceuticals in the natural environment, to the point where drug consumption data can be used as a surrogate for estimating background levels.

Fiers, et al., (2017), his research analysis on human and animal waste products account for the vast bulk of emissions throughout the lifecycle of medications (such as flushing drugs down the toilet). Many recent studies have therefore looked into how sludge, reclaimed water, or manure can be used in agricultural productions, as well as the potential shortcomings of wastewater treatments (on a municipal or hospital scale), which have been shown to significantly contribute to the discharge of pharmaceuticals into the environment. The role of manufacturing facilities in environmental contamination hotspots has been overlooked in the past but is becoming more widely acknowledged.

Austin, et al., (2017), analysed about Antibiotics, antineoplastics, NSAIDs, antiepileptics, anti-diabetic drugs, and many others have all been detected in the environment as a result of human activity, including their continuous

emission and subsequent destruction. Very few studies have focused on the prevalence of metabolites excreted by humans or animals, but recent research has shown that metabolites can be detected at levels greater than the parent chemical and are typically more persistent in the environment. Scientists are starting to pay a lot more attention to the issue.

3. Research methodology

This research was framed based on application of antibiotic drugs in Rajasthan. In order to achieve universal health care, the framework establishes the pharmaceutical source and intakes (Blaser, 2021). We analysed these factors carefully as we worked to extend the framework to include antibiotic drugs application. We analysed recent data on individual and national spending on medicine to determine who ultimately pays for pharmaceutical sources.

3.1. Sampling

The main objective of this study was to quantify the severity of the antibiotic drugs application in Rajasthan. In India, Rajasthan state has a population that is as diverse as its surroundings (Becker, 2018). To achieve accurate results, a sample size that adequately captures the region's variety in terms of demographics and socioeconomic status was chosen. We used the data analysis programme N-Master to assess the size of the sample required to test the assumption that a certain proportion of hospitals lacked essential medications. In this research work my sample frequency is 120 participants (Araujo, 2016).

3.2. Data collection & analysis

Hospitals as well as secondary sources provided the data we used. We were able to determine the application of antibiotic drugs in Rajasthan. The same time periods' data from the consumer expenditure surveys (CES) conducted by the National Sample Survey Office (NSSO) were also examined in the research (Sethi, 2021). Each year, the Consumer Electronics Show (CES) gathers price data on antibiotic drugs. The period of data collection is between “2017 to 2021”. Method for data analysis is based on statistical analysis, where random selection technique is utilized (Murray, 2022).

4. Result and discussion

Results from the study are highlighted by discussing about application of antibiotic drugs in Rajasthan. In this case, no attempt was made to measure coverage because doing so would have been incredibly challenging. In its place, an explanation based on survey has been supplied. The issue of antibiotic drugs application is quite complex. The rise of antibiotic-resistant microorganisms is the sole factor that has hastened the discovery of new medicines. In 2020, a Murray, (2022) was discovered in an E. coli strain, marking the first detection of resistance to penicillin before its widespread availability to the public in 1945. Even as early as 2021, four clinical strains of Martens, (2017) had already shown penicillinase-mediated resistance to penicillin. Unfortunately, I think this is simply the beginning. Every time a new antibiotic was introduced, news of a drug-resistant bacterial strain

quickly followed. This trend emerged across several different bacterial diseases over the course of several decades.

Table.1. Antibiotic drugs application in Jaipur, RDPL

S.no.	Variables	List of application years				
		2018	2019	2020	2021	2022
1.	Production (In %)	80.09	85.27	85.93	82.76	77.43
2.	Sales turnover (In %)	80.45	83.56	84.71	83.85	76.54

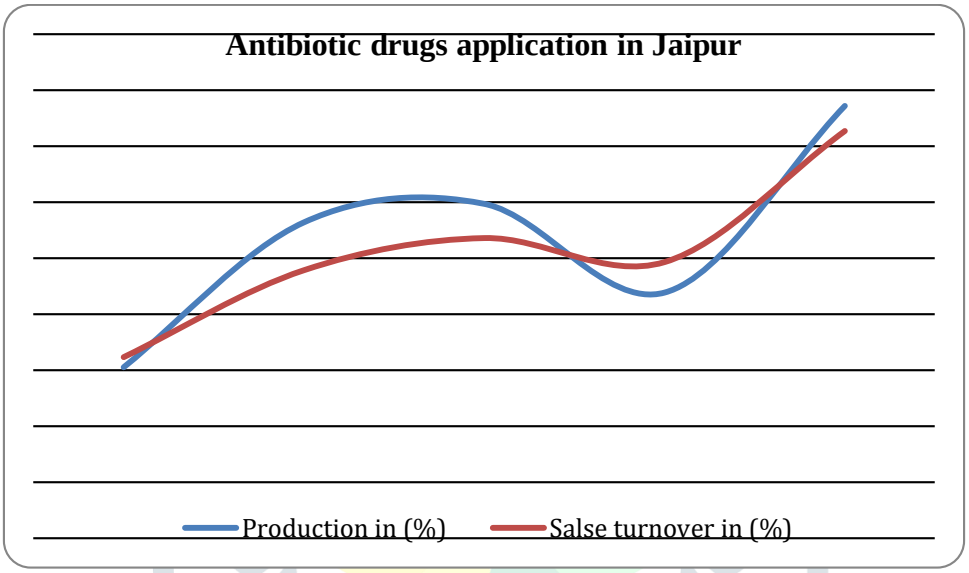

Figure.1. Illustration of antibiotic drug utilization in Jaipur, Rajasthan

Table.2. Summary of selected antibiotic drugs applicants

S.No.	List of variables (applicants)	List of regions	Frequency	Percentage (%)
1.	Community health care centre	Jaipur	30	25
2.	Primary health care centre	Udaipur	28	23.33
3.	Medical colleges	Shekhawati	31	25.36
4.	General Hospital	Ajmer	31	25.36

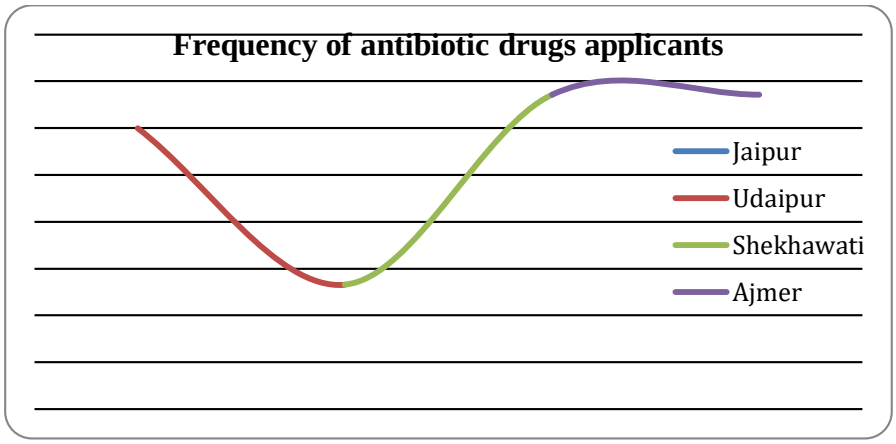

Figure.2. Illustration frequency of selected antibiotic drugs applicants

There is currently an abundance of antibiotic-resistant bacteria and a dearth of viable treatment options. Antibiotics will run out unless monitoring is enhanced and new medications are introduced (Newman, 2016). No one would put off getting treatment when they were sick out of fear of the cost if everyone had access to inexpensive medical care regardless of their financial situation. Due to the significance of medications to the practise of medical care, this inquiry will concentrate on them. The majority of individuals living in high income countries have access to free medical care and drugs thanks to the intricate prepayment and risk-pooling systems that their nations have developed (Sethi, 2021).

This strategy was so effective in 2021 that the government of the Indian state of Rajasthan chose to use it. This policy change is being put into effect in order to enhance the healthcare system more broadly (Murray, 2022). The increase in the first investment is the Rajasthan government's method of expressing how seriously it takes the current issue. Similar legislation was approved and made law in the Indian state of Rajasthan in 2011. This kind of action was done to overhaul the healthcare system as a whole (Becker, 2018). We significantly increased our investment as soon as it became clear that the state government of Rajasthan would keep its word.

5. Conclusion

The alarming rise of bacterial infections resistant to practically all known therapies has only recently pushed governments to take action. In light of the international outcry about antimicrobial drugs application, the government of the India has hired an economist, to head a strategic evaluation of drugs utilization. The hired economics analyst pointed out the challenges involved in commercialising a treatment that, if effective, will only require occasional dosing. Many factors, such as cheap cost and the risk that any novel antibiotic with a distinctive mechanism of action may be consigned to a treatment of last resort, impede antibiotic R&D. Solving these problems calls for out-of-the-box thinking, such as switching to a payment scheme unconnected to medicine sales.

It is a major challenge for the scientific community to find new chemical materials with the necessary physicochemical properties for antibiotic discovery and development. In any case, these advances are promising because NPs remain the most likely source of new elements. Since the antibiotic-producing capacity of the most-studied type of bacteria, the streptomycetes, has been undersampled, scientists now believe that hundreds of NP antibiotics lie latent in the bacterial world.

Recent technological advancements, including as CRISPR/Cas9-mediated genome editing, allow us to put this knowledge to use despite the lack of a standardised method for generating silent BGCs. Recent years have seen the identification of new molecular structures with unexpected biological activity, and future advancements in this field are likely to boost this rate of discovery even more. Thankfully, governments are starting to take notice, since the majority of NP antibiotics discovered so far come from a small subset of the world's bacteria, suggesting that there is reason for hope. New vaccines, antibody-antibiotic conjugates, probiotics, phage therapy, and rapid diagnostics are all viable strategies for combating antimicrobial resistance.

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