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Short Communication

Brand survey-based study of Ciprofloxacin-500 tablet marketing for Tuberculosis

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ABSTRACT

Marketing is the activity of showing up and advertising a company's products in the best possible way so that sales and profits can be maximized. The concept of marketing varies from person to person and company to company; even the process of marketing varies in a similar way. The current survey aims to study which brand has the highest sales value and why. The survey is primarily based on the brand survey-based study of Ciprofloxacin-500 tablets against tuberculosis. Our survey went in both online and offline modes, which overall counted for the participation of 1747 people. The survey was a grand success as it was performed under the guidance of many doctors and pharmacists. The overall discussions with the participants, doctors, and pharmacists brought us to the conclusion that Ciplox-500 has the highest sales, and the primary reason behind this was the brand value, as all of them replied in terms of better satisfaction and quality.

INTRODUCTION

Marketing refers to any actions a company takes to attract an audience to the company's product or services through high-quality messaging. Marketing aims to deliver standalone value for prospects and consumers through content, with the long-term goal of demonstrating product value, strengthening brand loyalty, and ultimately increasing sales(1). Marketing is a necessary component during product development, a sales pitch, or retail distribution. The purpose of marketing is to research and analyze consumers all the time(2). Marketing is the process of getting people interested in the company's product or service that happens through market research, analysis, and understanding the ideal customer's interest. Marketing pertains to all aspects of a business, including product development, distribution methods, sales, and advertising(3).

Modern marketing began in the 1950s, when people started to use more than just print media to endorse a product. As TV and soon the internet

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entered households, marketers could conduct entire campaigns across multiple platforms(4).

In fact, the fundamental purpose of marketing is to attract consumers to the brand through messaging that will be helpful and educational to the target audience, so the target gets converted into leads(5). The marketing plan works on the fact that the ultimate target needs to be achieved. There are various objectives for marketing; some of them are as follows:

1. Increase brand awareness among the target audience,
2. Increase market share by knowing the existing competition to find a good position in the market and to be considered as a reference for a segment of the market.
3. Launching a new product depends on the consumers' pain. Additionally, to choose a launch strategy and price,
4. Improved return on investment is one of the most important marketing metrics, as it is a direct indicator of how well a campaign is performing.
5. Introduce the company to new international or local markets,
6. Increase business profits,
7. Optimize the conversion funnel,
8. Capture new leads as it takes time to build a solid customer database.
9. Customer loyalty,
10. Increase sales(6).

Types of Marketing:

The success of the success of the marketing campaign depends entirely on where the target customers spend their time. It's up to the company to conduct market research that determines which types of marketing and which mix of tools within each type is best for building the brand. Here are several types of marketing that are relevant today, some of which have stood the test of time(7):

1. **Internet marketing:**

Inspired by an Excedrin product campaign that took place online, the very idea of having a presence on the internet for business reasons is a type of marketing in and of itself.

2. **Search engine optimization (SEO):**

This is the process of optimizing content on a website so that it appears in search engine results. It's used by marketers to attract people who perform searches that imply they're interested in learning about a particular industry.

3. **Blog marketing:**

blogs are no longer exclusive to individual brands; brands now publish blogs to write about their industry and nurture the interest of potential customers who browse the internet for information.

4. **Social media marketing:**

Businesses can use Facebook, Instagram, Twitter, LinkedIn, and similar social networks to create impressions on their audience over time.

5. **Print marketing:**

As newspapers and magazines get better at understanding who subscribes to their print material, businesses continue to sponsor articles, photography, and similar content in the publications their customers are

6. **Search engine marketing:**

This type of marketing is a bit different than SEO. Businesses can now pay a search engine to place links on pages of its index that get high exposure to their

7. **Video marketing:**

While there were once just commercials, marketers now put money into creating and publishing all kinds of videos that entertain and educate their core customers(8).

MARKETING AND ADVERTISING:

If marketing is a wheel, advertising is one spoke of that wheel. Marketing entails product development, market research, product distribution, sales strategy, public relations, and customer support. Marketing is necessary in all

stages of a business's selling journey, and it can use numerous platforms, social media channels, and teams within their organization to identify their audience, communicate with them, amplify their voice, and build brand loyalty over time. On the other hand, advertising is just one component of marketing. It's a strategic effort, usually paid for, to spread awareness of a product or service as a part of the more holistic goals outlined above. Put simply, it's not the only method used by marketers to sell a product(9)(10).

The 4 P's of Marketing:

In the 1960's, E. Jerome McCarthy came up with the 4 Ps of marketing: product, price, place, and promotion. Essentially, these 4 Ps explain how marketing interacts with each stage of the business(11).

Product:

Having a product is a key and is the root of all things marketing. A product could be anything that a company offers consumers to satisfy a need. The best thing to do is to decide on a product or service based both on the needs and motivations of consumers and how the product would benefit them, rather than on the object's physical characteristics or attributes(12).

Place:

Strategic merchandising locations can be anything from an online store to a channel of physical stores across multiple towns or countries. The goal of the distribution strategy is to enable potential clients to have easy access to your products and services as well as offer a good experience throughout the purchasing process(13).

Price:

How the company prices the products and services is an extremely important part of the marketing strategy. This factor affects other factors, such as:

a. The margin the company hopes to obtain,
b. What target market does the company want to appeal to, and what purchasing power does the consumer have? Do companies want to enter the luxury market or the mass market?,
c. The company's financial goals,
d. How does the competition price their products, and what possible product substitutes are there?,
e. Trends and fads,
f. Increasing your price in order to give a better perception of quality(14).

Promotion:

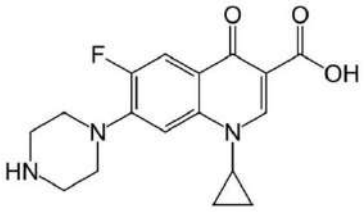
This refers to all the marketing and communication that is done in order to showcase the benefits of the product or service within the company. This is how the company increases sales(15).

Tuberculosis and Ciprofloxacin:

Despite 90 years of vaccination and 60 years of chemotherapy, tuberculosis (TB) remains the world's leading cause of death from an infectious agent, surpassing human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) for the first time. The World Health Organization (WHO) estimates that there are about 10.4 million new cases and 1.8 million deaths from TB each year. Tuberculosis is an infectious bacterial disease caused by Mycobacterium tuberculosis (Mtb), which is transmitted between humans through the respiratory route and most commonly affects the lungs but can damage any tissue. Only about 10 percent of individuals infected with Mtb progress to active TB disease within their lifetime; the remainder of those infected successfully contain their infection. One of the challenges of TB is that the pathogen persists in many infected individuals in a latent state for many years and can be reactivated to cause disease(16)(17). More sensitive methods of diagnosing TB and detecting resistance to drugs have recently become available, although they are more expensive. The time between the onset of disease and when diagnosis is made and treatment is initiated is often protracted, and such delays allow the transmission of disease(18). Although bacille Calmette-Guérin (BCG) remains the world's most widely used vaccine, its effectiveness is geographically highly variable and incomplete. Modeling suggests that more effective vaccines will likely be needed to drive tuberculosis toward elimination in high-incidence settings (19). Chemotherapy for TB is one of the most cost-effective of all health interventions. This evidence has been central to the global promotion of the WHO and Stop TB Partnership policy of directly observed therapy, the short course (DOTS) strategy, and the package of measures combining best practices in the diagnosis and care of patients with TB(19)(20). The DOTS strategy to control tuberculosis promotes standardized treatment with supervision and patient support that may include, but is far broader than, direct observation of therapy (DOT), where a health care worker personally observes the patient taking the medication(21). Infection begins with the entry of M. tuberculosis into the human pulmonary airspace and phagocytosis by alveolar macrophages (AM). M. tuberculosis proliferates in the AM, and another phagocytosis repeats until coagulation necrosis and epithelioid cell granuloma formation take place several weeks after infection. Primary focus and corresponding lymph nodes were affected by necrotizing epithelioid cell granuloma, which is characterized by exudative-type necrosis. Usually, the proliferation of M. tuberculosis ceases after necrotizing granuloma formation. Limited people developed tuberculosis after infection(22)(23). There are two types of tuberculosis: primary (following infection) and secondary (internal reactivation months to years after infection). When M. tuberculosis is not confined to the primary complex, then primary tuberculosis begins. Secondary tuberculosis begins if primary complex or minor disseminated lesions worsen due to an unknown cause, such as cavity formation following softening or new productive-type necrosis formation based on the original lesion. Recently, reinfection tuberculosis was seen among elderly people(22)(24)(25). WHO recommends the use of rapid molecular diagnostic tests as the initial diagnostic test in all persons with signs and symptoms of TB. A tuberculin skin test (TST) or interferon gamma release assay (IGRA) can be used to identify people with an infection(26)(27).

Tuberculosis disease is treated with antibiotics. Treatment is recommended for both TB infection and disease(28). To be effective, medications need to be taken daily for 4–6 months. It is dangerous to stop the medications early or without medical advice. This can allow TB that is still alive to become resistant to the drugs(29)(30). Ciprofloxacin is only indicated for infections caused by susceptible bacteria. Ciprofloxacin is a second-generation fluoroquinolone that is active against many Gram-negative and Gram-positive bacteria(31). Ciprofloxacin immediate release tablets, oral suspensions, and intravenous injections are indicated for the treatment of skin and skin structure infections, bone and joint infections, complicated intra-abdominal infections, nosocomial pneumonia, febrile neutropenia, adults who have inhaled anthrax, plague, chronic bacterial prostatitis, lower respiratory tract infections, including acute exacerbations of chronic bronchitis, urinary tract infections, complicated urinary tract infections in pediatrics, complicated pyelonephritis in pediatrics, and acute sinusitis(32)(33). A ciprofloxacin otic solution and otic suspension with hydrocortisone are indicated for acute otitis externa(34). Ciprofloxacin suspension with dexamethasone is indicated for acute otitis media in pediatric patients with tympanostomy tubes or acute otitis externa(35). A ciprofloxacin intratympanic injection is indicated for pediatric patients with bilateral otitis media with effusion who are having tympanostomy tubes placed or pediatric patients 6 months of age or older with acute otitis external(36)(37). A ciprofloxacin extended-release tablet is indicated for uncomplicated urinary tract infections, complicated urinary tract infections, and acute uncomplicated pyelonephritis(38).

Ciprofloxacin acts on bacterial topoisomerase II (DNA gyrase) and topoisomerase IV. Ciprofloxacin's targeting of the alpha subunits of DNA gyrase prevents it from supercoiling the bacterial DNA, which prevents DNA replication(39)(40). Ciprofloxacin binds to bacterial DNA gyrase with 100 times the affinity of mammalian DNA gyrase(41). There is no cross-resistance between fluoroquinolones and other classes of antibiotics, so it may be of clinical value when other antibiotics are no longer effective(19). Ciprofloxacin is readily absorbed, but its complete absorption is generally not achieved following oral administration, and its distribution in the tissues is high. A remarkable drug level is achieved in the kidney, prostate, liver, and lung(39). The metabolism is inactivating and is primarily mediated by glucuronide conjugation at the 3-carboxylic group. The piperazine ring is readily metabolized, and this results in decreased antimicrobial activity(42). Elimination occurs by both renal and non-renal routes, but the primary route of elimination is via the renal route through glomerulus filtration and tubular secretion(43). The secondary route of excretion is via the liver. Ciprofloxacin is poorly cleared by both peritoneal dialysis and hemodynamic dialysis. Some change in pharmacokinetics is observed in diseased conditions, although diarrhea or cutaneous infections in human beings do not alter the oral absorption of ciprofloxacin(44)(45). In the case of bacteremia, serum concentrations remain sufficient for effective treatment of gram-negative infections, although differences can be observed in different analogs. The metabolism of ciprofloxacin to oxociprofloxacin is reduced in hepatic cirrhosis(46)(47)(48). Toxicity of ciprofloxacin involves nausea, vomiting, and diarrhea; induces aseptic meningitis and arthritis damage; increases in infective complications and resistance; skin photosensitivity reactions; bone and joint damage in children; dizziness, insomnia, and mood alterations; seizures and hallucinations; and agranulocytosis(49)(50).



CIPROFLOXACIN STRUCTURE AND CHEMICAL DESCRIPTION

Chemical Formula: C17H18FN3O3
Molecular weight average: 331.3415
Monoisotopic molecular weight average : 331.133219662
IUPAC Name: 1-cyclopropyl-6-fluoro-4-oxo-7-piperazin-1-ylquinoline-3-carboxylic acid

Figure 1: Ciprofloxacin Chemical structure and description (51)

Survey: Aim and Methodology

A survey was done in the Dehradun, Uttarakhand, India region to determine which brand of ciprofloxacin was in use preferentially for tuberculosis in the same region. Further the study was extended by making an online survey for the same. The questionnaire for the offline and online is given below: Three brands of ciprofloxacin—Ciplox-500, Cifran-500, Ciprobid-500, and Floxip-500—were selected for the ultimate survey based on their sales and number of prescriber's profiles, as discussed with various pharmacists and physicians. The survey was performed by visiting various hospitals and pharmacy stores and asking the visiting individuals the same. The complete survey was done with the permission and guidance of hospital management and the pharmacists at pharmacy stores.

Table 1: Ciprofloxacin tablet-500 brand data selected for survey

Brand name	Company	Quantity tablet per strip
Ciplox-500	Cipla Ltd	10
Cifran-500	Sun Pharma	10
Ciprobid-500	Zydus Cadila Healthcare Ltd.	10
Floxcip-500	Abbott	10

*Storage condition for all four brands is below 30 degree Celsius

Questionnaire for the offline and online mode survey was same and given as:

1. Email-id* (for online)
2. State* (for online)
3. Age group*

- Below 20 years
- 20-30 years
- 30-50 years
- Above 50 years

4. Prescription pattern for ciprofloxacin-500 mg*

- By physician
- By pharmacist
- Self
- Others

5. Reason for using ciprofloxacin-500 mg*

- Tuberculosis
- Others

6. Which brand of ciprofloxacin do you prefer mostly?*

- Ciplox-500
- Cifran-500
- Ciprobid-500
- Floxip-500

7. Reason for choosing the brand*

- Price
- Brand Value
- Others

8. Are you satisfied with the brand*

- Yes
- No

9. Will you recommend the brand to others*

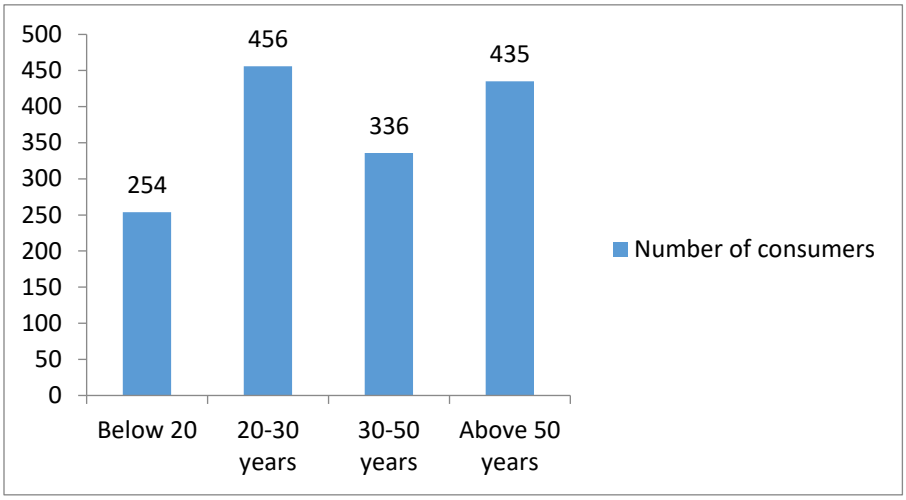
- Yes
- No

(* Mark represents that it's compulsory to give the answer in case of online survey)

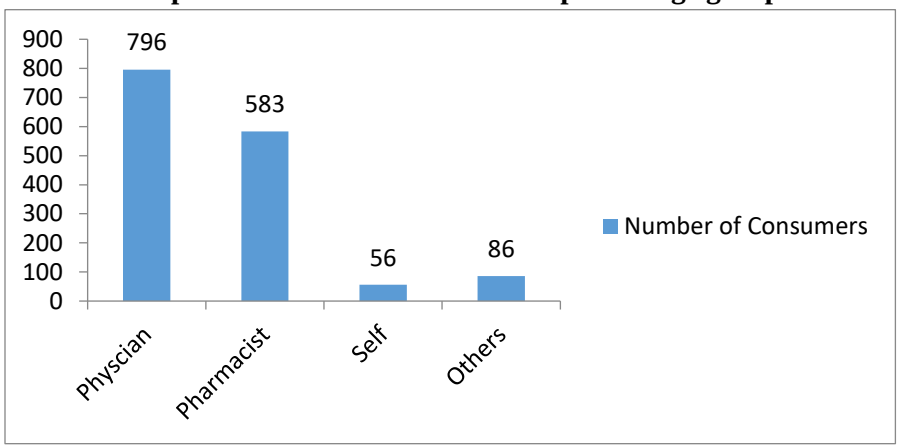
RESULTS:

About 1521 individuals participated all over the Dehradun city in offline survey and The results are given presented graphically.

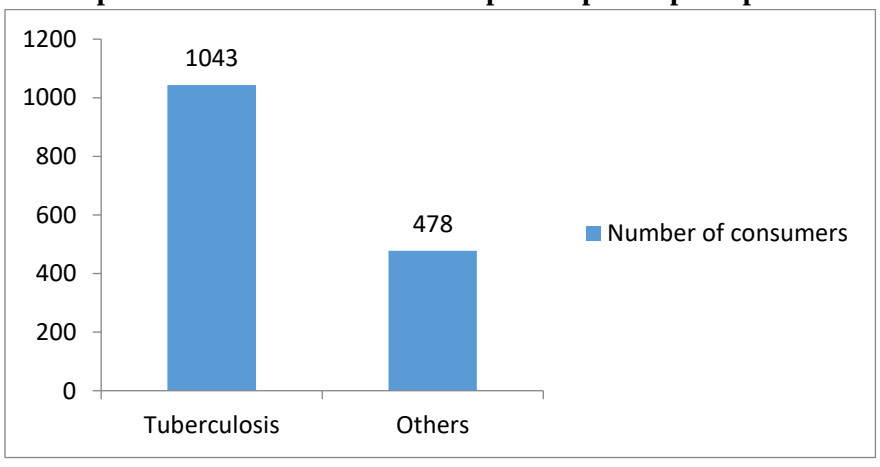
For offline Survey



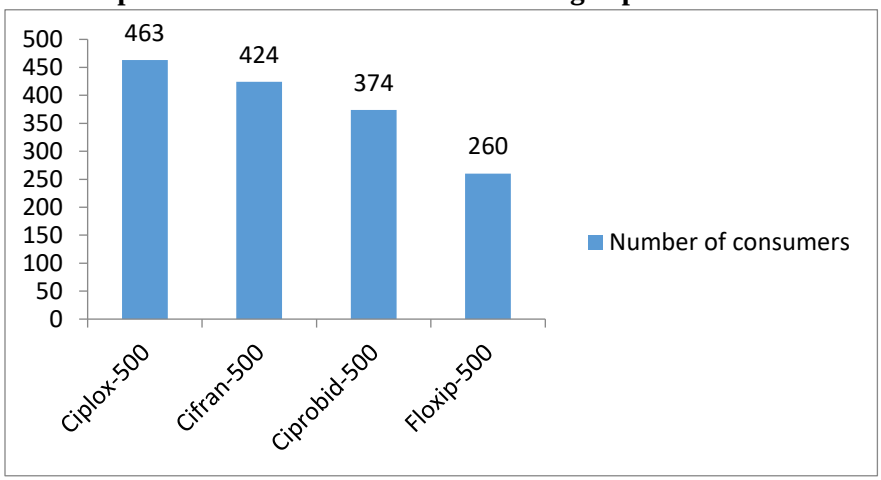
Graph 1: Number of consumers as per the age group



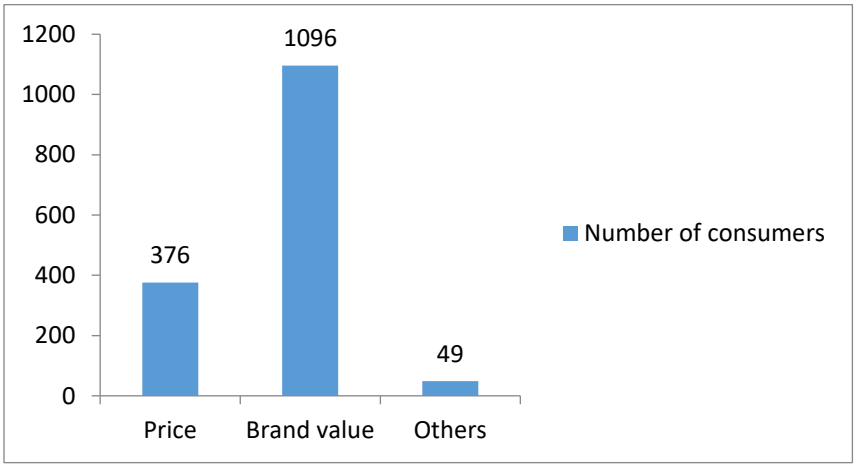
Graph 2: Number of consumers as per the prescription pattern



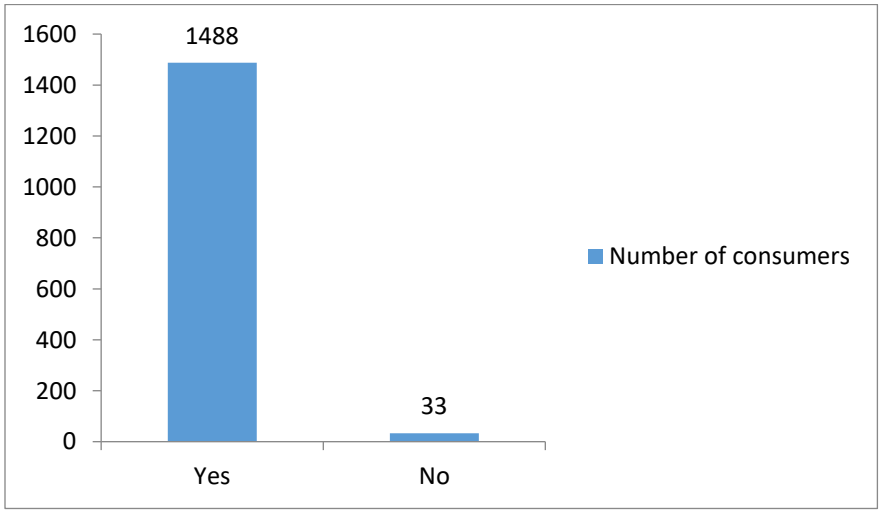
Graph 3: Number of consumers for using Ciprofloxacin-500



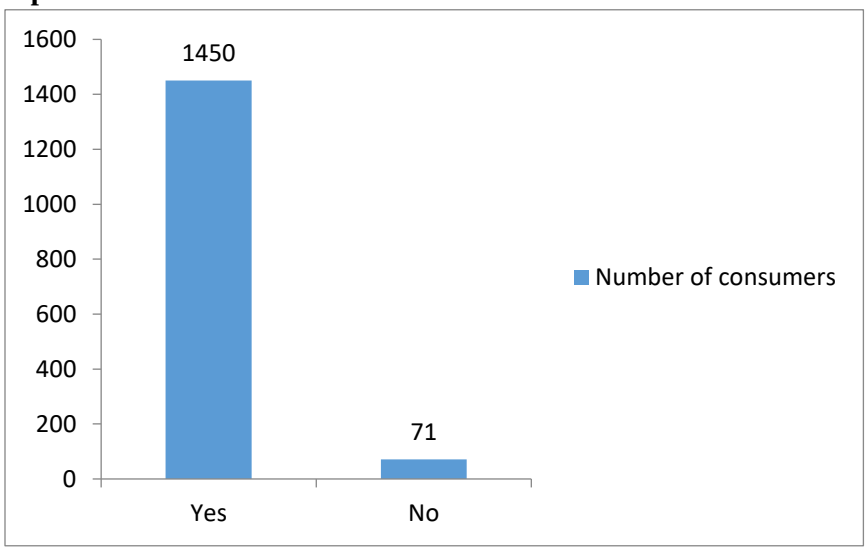
Graph 5: Number of consumers as per the reason for choosing the brand



Graph 6: Number of consumers and their satisfaction towards the brand



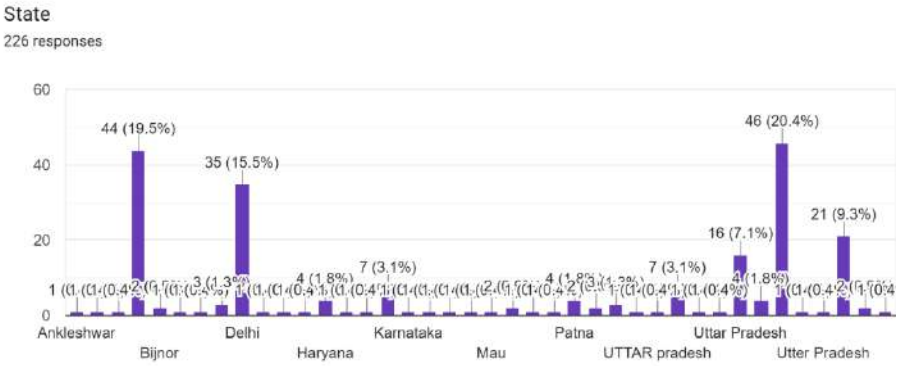
Graph 7: Number of consumers and their satisfaction towards the brand

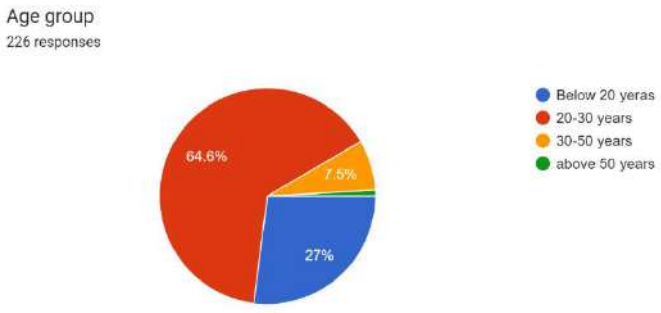


For Online survey

Here is the attached google form link for the online survey.

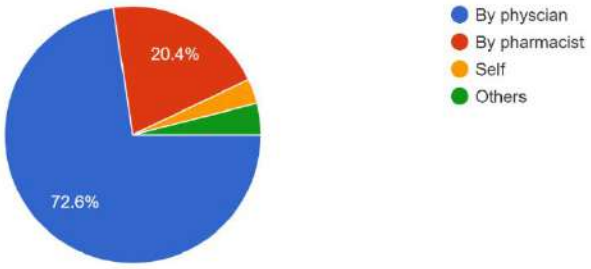
https://docs.google.com/forms/d/e/1FAIpQLScAwfZA7sMgnVFGujcEREQ3HuEPREQS95GclVs_BCscLXcvpQ/viewform?usp=sf_link 226 people participated in the survey all over the country and here are the results.





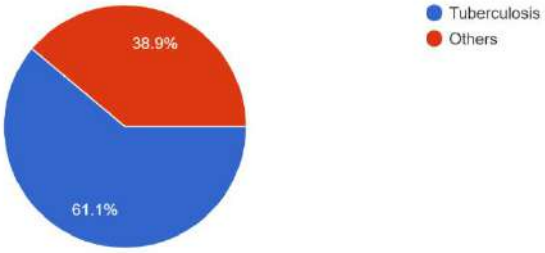
Prescription pattern for ciprofloxacin-500 mg

226 responses



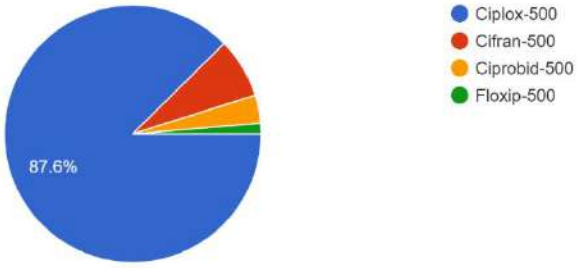
Reason for using ciprofloxacin-500 mg

226 responses



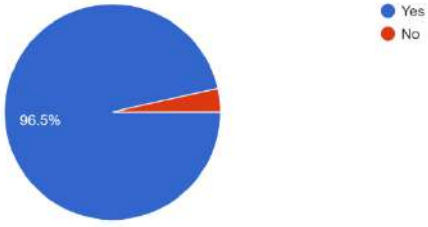
Which brand of Ciprofloxacin do you prefer mostly?

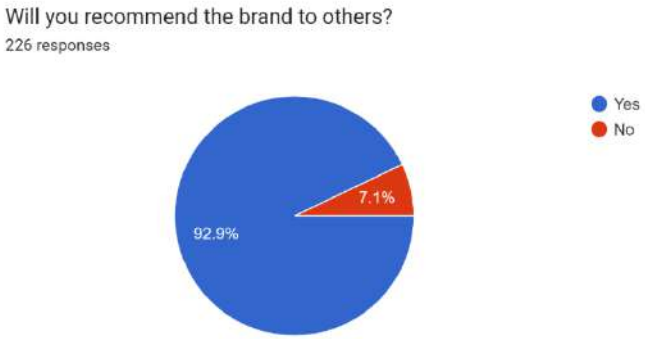
226 responses



Are you satisfied with the brand?

226 responses





CONCLUSION:

The survey was done successfully to understand the marketing and related strategies. The purpose of performing the survey was also achieved, which was to know which brand has the highest sales value and why. Our survey concluded that Ciplox-500 has the highest sales value (30% in the offline survey and 87.6% in the online survey), and the reason behind this was found to be the brand value, as we conclude. This suggests that Cipla is providing the highest quality level of ciprofloxacin tablets, as per our study and survey. The marketing value was followed by cifran-500, ciprobid-500, and the least of the floxip-500. Although we don't conclude the supremacy of any brand, the aim of the survey is to study the marketing of a pharmaceutical product.

REFERENCES:

1. Marketing: What Is It and Why Do Companies Need It? | Coursera [Internet]. [cited 2024 Apr 4]. Available from: https://www.coursera.org/articles/marketing-is
2. What is Marketing, and What's Its Purpose? [Internet]. [cited 2024 Apr 4]. Available from: https://blog.hubspot.com/marketing/what-is-marketing
3. What is Marketing? | MV3 Marketing Experts Read More Now! [Internet]. [cited 2024 Apr 4]. Available from: https://www.mv3marketing.com/glossary/marketing/
4. How Brands Were Born: A Brief History of Modern Marketing - The Atlantic [Internet]. [cited 2024 Apr 5]. Available from: https://www.theatlantic.com/business/archive/2011/10/how-brands-were-born-a-brief-history-of-modern-marketing/246012/
5. What Is Marketing? Definition, Strategies & Best Practices – Forbes Advisor [Internet]. [cited 2024 Apr 5]. Available from: https://www.forbes.com/advisor/business/what-is-marketing/
6. What Is a Marketing Plan? And How to Create One | Coursera [Internet]. [cited 2024 Apr 5]. Available from: https://www.coursera.org/articles/marketing-plan
7. 8 Types of Marketing Campaigns (With Inspiring Examples) [Internet]. [cited 2024 Apr 5]. Available from: https://ahrefs.com/blog/marketing-campaign/
8. The Ultimate Guide to Internet Marketing [Data + Expert Tips] [Internet]. [cited 2024 Apr 5]. Available from: https://blog.hubspot.com/marketing/internet-marketing
9. What is the Purpose of Marketing? [FAQ] [Internet]. [cited 2024 Apr 5]. Available from: https://www.linkedin.com/pulse/what-purpose-marketing-faq-abhishek-bhosale
10. (PDF) Pharmacuetical Marketing Management [Internet]. [cited 2024 Apr 5]. Available from:

https://www.researchgate.net/publication/301228655_Pharmacuetical_Marketing_Management

11. Yudelson J. Adapting Mccarthy's Four P's for the Twenty-First Century. http://dx.doi.org/101177/0273475399211008 [Internet]. 1999 Apr 1 [cited 2024 Apr 5];21(1):60–7. Available from: https://journals.sagepub.com/doi/abs/10.1177/0273475399211008
12. Product Marketing: What It Is & How It Works [Internet]. [cited 2024 Apr 5]. Available from: https://ahrefs.com/blog/product-marketing/
13. Strategic merchandising secrets for ecommerce businesses | Algolia [Internet]. [cited 2024 Apr 5]. Available from: https://www.algolia.com/blog/ecommerce/merchandising-strategies-that-drive-sales-and-roi/
14. Understanding Pricing Strategies, Price Points And Maximizing Revenue [Internet]. [cited 2024 Apr 5]. Available from: https://www.forbes.com/sites/forbesbusinesscouncil/2022/08/22/understanding-pricing-strategies-price-points-and-maximizing-revenue/?sh=7313cf27e96a
15. What is Promotional Marketing & How Does It Work [Internet]. [cited 2024 Apr 5]. Available from: https://www.reliablesoft.net/promotional-marketing/
16. Maiolini M, Gause S, Taylor J, Steakin T, Shipp G, Lamichhane P, et al. The War against Tuberculosis: A Review of Natural Compounds and Their Derivatives. Molecules [Internet]. 2020 Jul 1 [cited 2024 Apr 5];25(13). Available from: /pmc/articles/PMC7412169/
17. Villar-Hernández R, Ghodousi A, Konstantynovska O, Duarte R, Lange C, Raviglione M. Tuberculosis: current challenges and beyond. Breathe [Internet]. 2023 Mar 1 [cited 2024 Apr 5];19(1). Available from: /pmc/articles/PMC10270564/
18. 3.2 Diagnostic testing for TB, HIV and drug-resistant TB [Internet]. [cited 2024 Apr 5]. Available from: https://www.who.int/publications/digital/global-tuberculosis-report-2021/tb-diagnosis-treatment/diagnostic-testing
19. Terreni M, Taccani M, Pregnolato M. New Antibiotics for Multidrug-Resistant Bacterial Strains: Latest Research Developments and Future Perspectives. Molecules [Internet]. 2021 May 2 [cited 2024 Apr 6];26(9). Available from: /pmc/articles/PMC8125338/
20. Liyew AM, Gilmour B, Clements ACA, Alene KA. Comparative effectiveness of interventions for preventing tuberculosis: systematic review and network meta-analysis of interventional studies. eClinicalMedicine [Internet]. 2023 Oct 1 [cited 2024 Apr 6];64. Available from: http://www.thelancet.com/article/S2589537023003863/fulltext
21. Dye C, Floyd K. Tuberculosis. Dis Control Priorities Dev Ctries [Internet]. 2006 [cited 2024 Apr 5]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK11724/
22. Balasubramanian V, Wiegeshaus EH, Taylor BT, Smith DW. Pathogenesis of tuberculosis: pathway to apical localization. Tuber Lung Dis. 1994;75(3):168–78.
23. Ridley MJ, Heather CJ, Brown I, Willoughby DA. Experimental epithelioid cell granulomas tubercle formation and immunological competence: An ultrastructural analysis. J Pathol. 1983;141(2):97–112.
24. Yamagishi F, Shimokata K. Tuberculosis in compromised hosts. Kekkaku. 2003 Nov;78(11):717–22.

25. Tomioka H, Namba K. Development of antituberculous drugs: Current status and future prospects. Kekkaku. 2006 Dec;81(12):753–74.
26. 2.2 Diagnostic testing for TB [Internet]. [cited 2024 Apr 5]. Available from: https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2023/tb-diagnosis---treatment/2.2-diagnostic-testing-for-tb
27. Tuberculosis [Internet]. [cited 2024 Apr 5]. Available from: https://www.who.int/news-room/fact-sheets/detail/tuberculosis
28. Tuberculosis [Internet]. [cited 2024 Apr 6]. Available from: https://www.who.int/news-room/fact-sheets/detail/tuberculosis
29. Treatment for TB Disease | TB | CDC [Internet]. [cited 2024 Apr 5]. Available from: https://www.cdc.gov/tb/topic/treatment/tbdisease.htm
30. Treatment for Latent TB Infection and TB Disease | TB | CDC [Internet]. [cited 2024 Apr 5]. Available from: https://www.cdc.gov/tb/topic/treatment/default.htm
31. Thai T, Salisbury BH, Zito PM. Ciprofloxacin. StatPearls Publ [Internet]. 2023 Aug 28 [cited 2024 Apr 6];(2023 Jan-). Available from: https://www.ncbi.nlm.nih.gov/books/NBK535454/
32. Thai T, Salisbury BH, Zito PM. Ciprofloxacin. StatPearls Publ [Internet]. 2023 Aug 28 [cited 2024 Apr 5];(2023 Jan-). Available from: https://www.ncbi.nlm.nih.gov/books/NBK535454/
33. Ciprofloxacin - StatPearls - NCBI Bookshelf [Internet]. [cited 2024 Apr 5]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK535454/
34. Ciprofloxacin And Hydrocortisone (Otic Route) Proper Use - Mayo Clinic [Internet]. [cited 2024 Apr 6]. Available from: https://www.mayoclinic.org/drugs-supplements/ciprofloxacin-and-hydrocortisone-otic-route/proper-use/DRG-20072176?p=1
35. Ciprofloxacin / Dexamethasone Otic Dosage Guide + Max Dose, Adjustments - Drugs.com [Internet]. [cited 2024 Apr 6]. Available from: https://www.drugs.com/dosage/ciprofloxacin-dexamethasone-otic.html
36. Mösges R, Nematian-Samani M, Eichel A. Treatment of acute otitis externa with ciprofloxacin otic 0.2% antibiotic ear solution. Ther Clin Risk Manag [Internet]. 2011 Jul [cited 2024 Apr 5];7:325. Available from: /pmc/articles/PMC3150478/
37. Treatment of acute otitis externa with ciprofloxacin otic 0.2% antibiotic ear solution - PMC [Internet]. [cited 2024 Apr 5]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3150478/
38. Waugh J, Keating GM. Ciprofloxacin extended release: in the treatment of urinary tract infections and uncomplicated pyelonephritis. Drugs Aging [Internet]. 2004 [cited 2024 Apr 5];21(1):55–64. Available from: https://pubmed.ncbi.nlm.nih.gov/14715044/
39. Shariati A, Arshadi M, Khosrojerdi MA, Abedinzadeh M, Ganjalishahi M, Maleki A, et al. The resistance mechanisms of bacteria against ciprofloxacin and new approaches for enhancing the efficacy of this antibiotic. Front Public Heal [Internet]. 2022 Dec 21 [cited 2024 Apr 6];10. Available from: /pmc/articles/PMC9815622/
40. Samir M, Ramadan M, Abdelrahman MH, Elbastawesy MAI, Halby HM, Abdel-Aziz M, et al. New potent ciprofloxacin-uracil

conjugates as DNA gyrase and topoisomerase IV inhibitors against methicillin-resistant Staphylococcus aureus. Bioorg Med Chem. 2022 Nov 1;73:117004.

41. Hangas A, Aasumets K, Kekäläinen NJ, Paloheinä M, Pohjoismäki JL, Gerhold JM, et al. Ciprofloxacin impairs mitochondrial DNA replication initiation through inhibition of Topoisomerase 2. Nucleic Acids Res [Internet]. 2018 Oct 10 [cited 2024 Apr 6];46(18):9625. Available from: /pmc/articles/PMC6182158/
42. Yang G, Ge S, Singh R, Basu S, Shatzer K, Zen M, et al. Glucuronidation: Driving Factors and Their Impact on Glucuronide Disposition. Drug Metab Rev [Internet]. 2017 Apr 3 [cited 2024 Apr 6];49(2):105. Available from: /pmc/articles/PMC7660525/
43. Pichai E, Lakshmanan M. Drug Elimination. Introd to Basics Pharmacol Toxicol Vol 1 Gen Mol Pharmacol Princ Drug Action [Internet]. 2023 Jul 4 [cited 2024 Apr 6];117–29. Available from: https://www.ncbi.nlm.nih.gov/books/NBK547662/
44. Vaja R, Rana M. Drugs and the liver. Anaesth Intensive Care Med [Internet]. 2020 Oct 1 [cited 2024 Apr 6];21(10):517. Available from: /pmc/articles/PMC7508170/
45. Xu L, Liu J, Lu M, Yang D, Zheng X. Liver injury during highly pathogenic human coronavirus infections. Liver Int. 2020 May 1;40(5):998–1004.
46. Heil EL, Bork JT, Abbo LM, Barlam TF, Cosgrove SE, Davis A, et al. Optimizing the Management of Uncomplicated Gram-Negative Bloodstream Infections: Consensus Guidance Using a Modified Delphi Process. Open Forum Infect Dis [Internet]. 2021 Oct 1 [cited 2024 Apr 6];8(10). Available from: /pmc/articles/PMC8561258/
47. Sharma PC, Jain A, Jain S, Pahwa R, Yar MS. Ciprofloxacin: review on developments in synthetic, analytical, and medicinal aspects. J Enzyme Inhib Med Chem [Internet]. 2010 Aug [cited 2024 Apr 6];25(4):577–89. Available from: https://www.tandfonline.com/doi/abs/10.3109/14756360903373350
48. Torriero AAJ, Ruiz-Díaz JJJ, Salinas E, Marchevsky EJ, Sanz MI, Raba J. Enzymatic rotating biosensor for ciprofloxacin determination. Talanta. 2006 May 15;69(3):691–9.
49. Cipro Side Effects: What They Are and How to Manage Them [Internet]. [cited 2024 Apr 6]. Available from: https://www.healthline.com/health/drugs/cipro-side-effects
50. Ciprofloxacin side effects and how to avoid them | SingleCare [Internet]. [cited 2024 Apr 6]. Available from: https://www.singlecare.com/blog/ciprofloxacin-side-effects/
51. Fabbiani FPA, Dittrich B, Florence AJ, Gelbrich T, Hursthouse MB, Kuhs WF, et al. Crystal structures with a challenge: High-pressure crystallisation of ciprofloxacin sodium salts and their recovery to ambient pressure. CrystEngComm. 2009;11(7):1396–406.

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