e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(11); 250-256

Original Research Article

Physicians' Perspectives and Opinion towards the Utilization of Cefpodoxime Proxetil: A Nationwide Study

R. Janarthanan[1], Amitrajit Pal[2], Dattatray Pawar[3], Akhilesh Sharma[4]

[1]Department of Pharmacology, Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura, Karnataka

[2,3,4]Medical Affairs Department, Alkem Laboratories Ltd., Mumbai

Received: 18-08-2024 / Revised: 21-09-2024 / Accepted: 26-10-2024

Corresponding author: Dr. Amitrajit Pal

Conflict of interest: Nil

Abstract:

Background: Cefpodoxime proxetil, a third-generation cephalosporin, is widely used for treating bacterial infections in both paediatric and adult populations. Despite its common use, limited data exists on physicians' perspectives regarding its utilization across different age groups. This study aimed to gather insights into perceived effectiveness and attitudes toward cefpodoxime proxetil among physicians nationwide.

Methods: A nationwide, multicentre, cross-sectional study was conducted using a structured questionnaire. The study targeted physicians from various specialities, including paediatrics, general practice, and internal medicine, across multiple centres. The questionnaire assessed physicians' opinions, perceptions, and attitudes toward cefpodoxime proxetil in treating bacterial infections in paediatric and adult patients.

Results: In the interim analyses, study responses from a total of 4403 healthcare professionals (HCPs) were taken, with 53.7% being general practitioners. The majority of the HCPs always (79.5%) preferred cefpodoxime as a first-line agent in clinical practice, primarily due to its efficacy (63.8%) followed by safety (23%). About 34.2% of HCPs preferred routine susceptibility testing before prescribing and 49% emphasized patient education on completing the full course of treatment through both written and verbal instructions. Notably, 76% of HCPs did not encounter any cases of clostridium difficile-associated diarrhoea. Most HCPs followed conventional twice-daily oral therapy for respiratory tract infections, and none reported challenges during the treatment period.

Conclusion: The study highlights the widespread acceptance of cefpodoxime proxetil as an effective and safe treatment option, with variations in its utilization across paediatric and adult populations. These insights can further guide future clinical guidelines and decision-making in managing bacterial infections.

Keywords: Cephalosporins, Clostridium difficile-associated diarrhoea, Antibiotic Resistance, Respiratory tract infections.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Bacterial infections continue to be a significant global health concern, contributing to increased morbidity and mortality rates worldwide. Bacterial pathogens were associated with 13.6% of all deaths globally and were responsible for 56.2% of sepsis-related deaths. [1] According to the World Health Organization (WHO), pneumonia claimed the lives of over 808,000 children under 5 years of age in 2017, accounting for 15% of all deaths in this age group. [2] Respiratory tract infections caused over 2.6 million deaths worldwide, making them the 5th leading cause of death overall and the leading infectious cause of death in children under 5 years of age. [3] Bacteria such as Haemophilus influenzae, Streptococcus pneumoniae, and Moraxella catarrhalis are common pathogens involved in respiratory tract infections. Cefpodoxime proxetil, a third-generation cephalosporin, has demonstrated efficacy against these pathogens, making it a suitable choice for treating respiratory tract infections. [4] Cefpodoxime offers a broad spectrum of antibacterial activity against gram-negative and gram-positive bacteria, making it a potential option for empirically treating various community-acquired infections in adults and children. [5] It works by inhibiting the synthesis of bacterial cell walls, effectively killing the susceptible bacteria. Cefpodoxime proxetil is available in oral tablet or suspension forms and is prescribed according to the type and severity of the infection, as well as the patient's age and medical history. [6,7] Prescribing cefpodoxime proxetil requires a careful balance between therapeutic benefits and the potential risks

involved, and factors such as efficacy, safety profile, patient considerations, Spectrum of activity, guideline adherence and side effect management determine the physician's preferences. Gaining insights into physician preferences for cefpodoxime proxetil is crucial for various reasons. It enhances our understanding of how physicians apply clinical guidelines in real-world contexts, supports efforts to combat antibiotic resistance, and aids in developing educational materials that empower patients to understand their treatment better.

Furthermore, this knowledge contributes to formulating more practical and targeted clinical guidelines, identifying areas where additional research is necessary, and ultimately optimizing the use of antibiotics to improve patient outcomes. Thus, this study aimed to assess the physician's opinions on cefpodoxime proxetil for pediatric and adult patients, evaluate their attitudes towards its management, and identify any concerns regarding its prescription.

Methods

A nationwide, multicentre, cross-sectional, observational, questionnaire-based study was conducted to assess physicians' perspectives and opinions on using cefpodoxime proxetil in paediatric and adult patients in India. Under Good Clinical Practice (GCP) and the declaration of Helsinki, this study was conducted following strict adherence to ethical guidelines, ensuring compliance with the Indian Council of Medical Research (ICMR) standards. Ethical approval was obtained from a registered Institutional Ethics Committee (IEC) before study initiation. All study data were anonymized to maintain physician confidentiality, with data protection and medical confidentiality upheld throughout the study. A total of 4,403 medical practitioners, comprising general physicians, paediatricians, ENT and surgeons from diverse healthcare facilities, participated in this study.

The study questionnaire consisted of 15 multiple-choice questions to capture detailed insights into prescription patterns, physician concerns, and decision-making factors. The questionnaire was then administered electronically via a secure online platform, allowing for easy access and timely responses from participants. All responses were reviewed for completeness. Microsoft Excel was used for data analysis. Data were analyzed using descriptive statistics. The data variables were expressed as numbers or percentages.

Results

A total of 4,403 healthcare professionals (HCPs) participated in the study of which the majority of respondents were general practitioners, comprising 53.7% of the total sample. Pediatricians accounted for 17.4%, followed closely by physicians and surgeons specialized in medicine at 16.3%. The contribution of ENT surgeons and other specialties was less. (Figure 1)

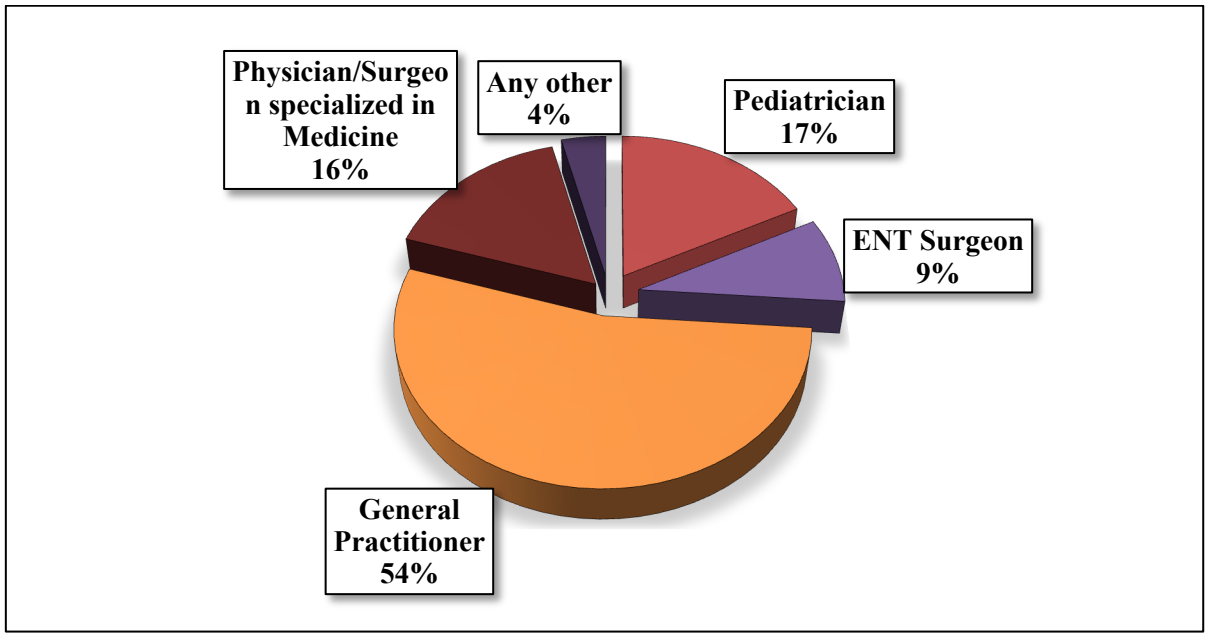

Figure 1: Speciality of the physician who participated in the study

When queried about the frequency of prescribing cefpodoxime proxetil, about 3,176 of HCPs i.e. 72.2% reported that they "always" prescribe cefpodoxime proxetil, with an additional 25.7% stating that they prescribe it "often". (Figure 2)

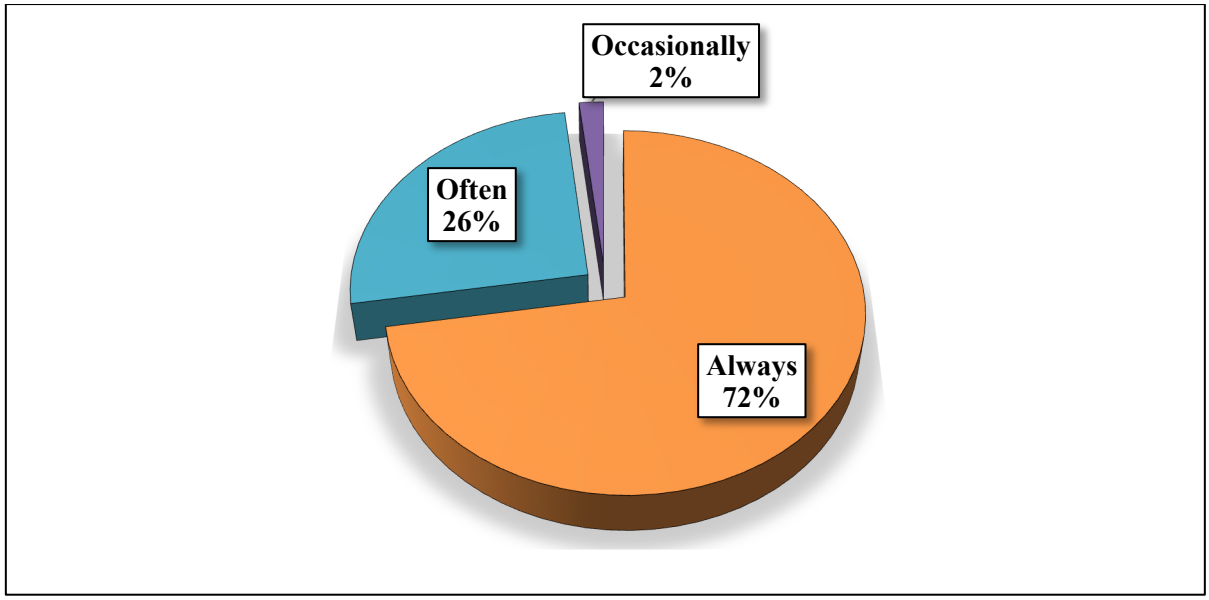

Figure 2: Frequency of Prescribing Cefpodoxime Proxetil

As shown in Table 1, most HCPs 2811 (63.8%) prescribed cefpodoxime proxetil over other antibiotics primarily due to its efficacy. Safety profile was the second most important consideration 1023 (23.2%), followed by its spectrum of activity 415 (9.4%). While cost-effectiveness and patient preference were the other less influential factors. (Figure 3)

Table 1: Reason for prescribing Cefpodoxime Proxetil

Reasons	No of responses	Percentage (%)
Efficacy	2811	63.8
Safety profile	1023	23.2
Cost-Effectiveness	97	2.2
Patient preference	57	1.3
Spectrum of activity	415	9.4

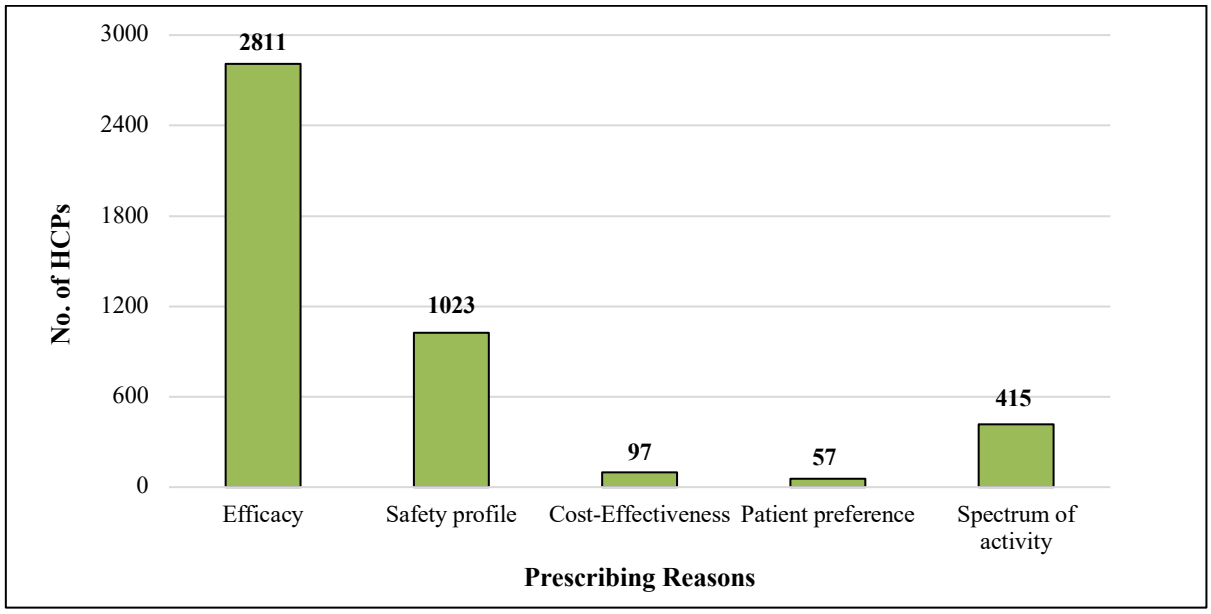

Figure 3: Reason for prescribing Cefpodoxime Proxetil

As shown in Table 2, most of the HCPs i.e. 1731 (39.3%) assessed the appropriateness of cefpodoxime proxetil mainly through empirical treatment based on symptoms and 1651 (37.5%) HCPs based on clinical guidelines. Whereas only a few HCPs relied on culture and susceptibility testing, while the combination of all methods was used by 630 (14.3%) of HCPs. (Figure 4)

Table 2: Appropriateness of Assessment Method

Assessment Method	No of responses	Percentage (%)
Based on clinical guidelines	1651	37.5
Culture and susceptibility testing	391	8.9
Empirical treatment based on symptoms	1731	39.3
Combination of all	630	14.3
Based on clinical guidelines	1651	37.5

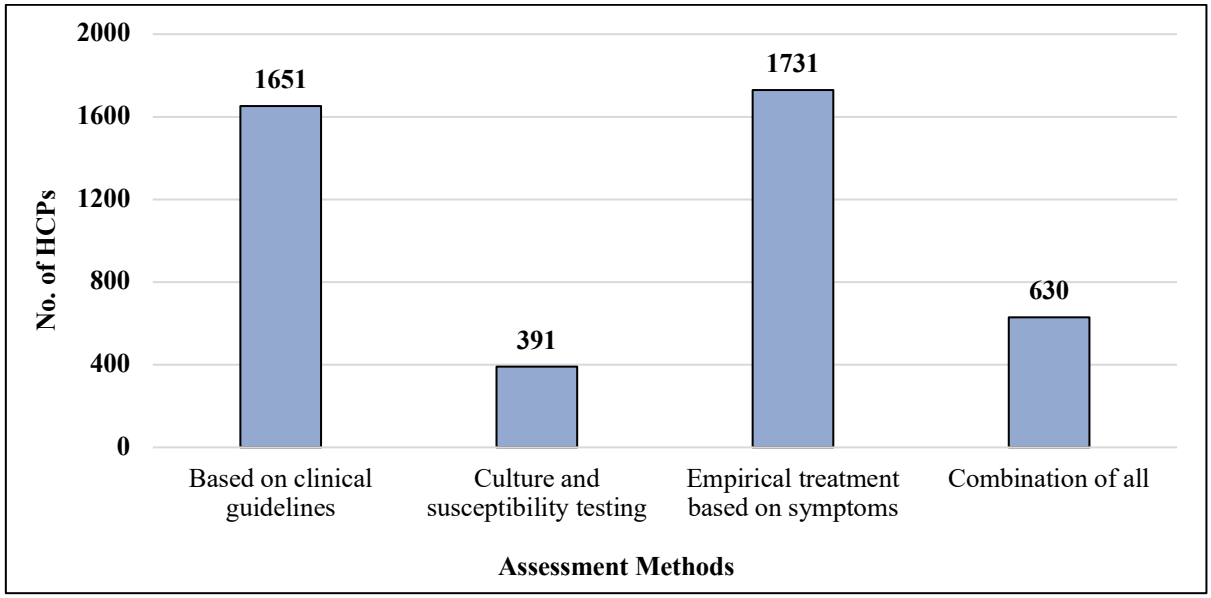

Figure 4: Appropriateness of Assessment Method

In cases of treatment failure or resistance, physicians are divided between switching to another antibiotic (35.2%) and performing additional diagnostic tests (38.8%).

A smaller number of HCPs extended the treatment duration, while only 2.0% consulted a specialist. In patients with penicillin allergy, about 59.6% of HCPs prescribed cefpodoxime proxetil with caution and closely monitored the patient, while 27.4% chose to avoid prescribing it only 11.2% conducted allergy testing before prescribing.

A huge percentage of 79.5% of HCPs preferred cefpodoxime proxetil over other antibiotics as their first-line choice, particularly for respiratory tract infections. A smaller percentage used it as a second-line option or as an alternative. (Figure 5)

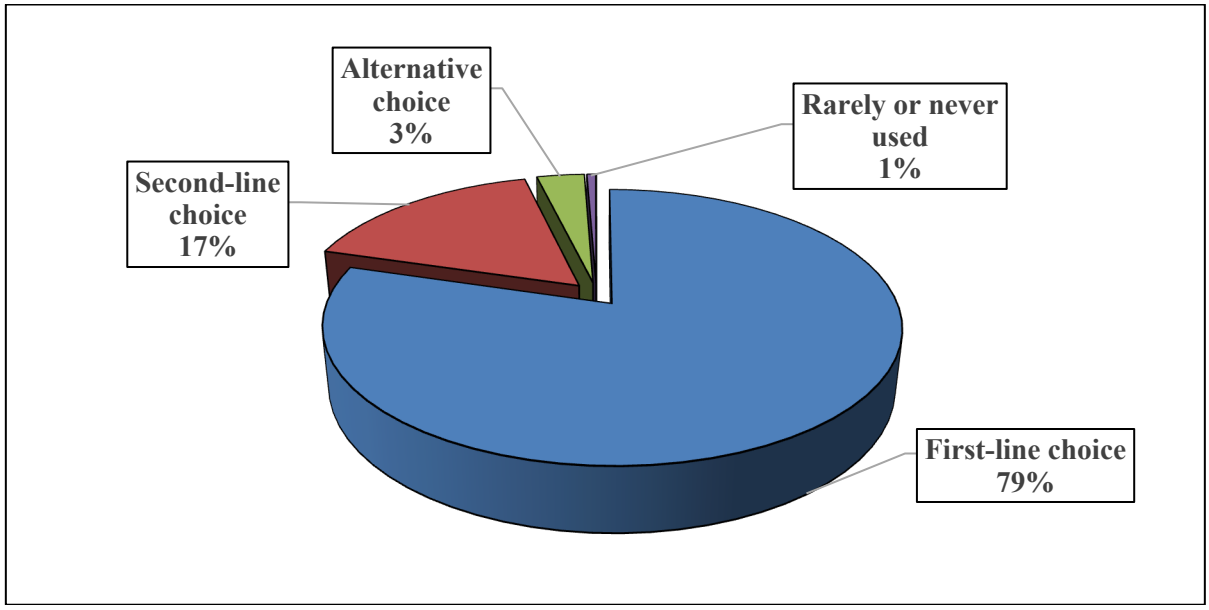

Figure 5: Prioritization of Cefpodoxime Compared to Other Antibiotics

Interestingly, 34.2% of physicians performed susceptibility testing before prescribing cefpodoxime proxetil. Similarly, routine monitoring of liver and renal function tests was practised, with 35.2% of respondents indicating the need for periodic assessment to ensure patient safety and optimize therapeutic outcomes.

Regarding patient education on full course completion on cefpodoxime proxetil treatment, almost half of the physicians (49%) provided both written and verbal instructions. Around 28.6% relied solely on verbal instructions, while 21.7% provided only written guidance and only a few HPCs did not routinely educate patients. (Figure 6)

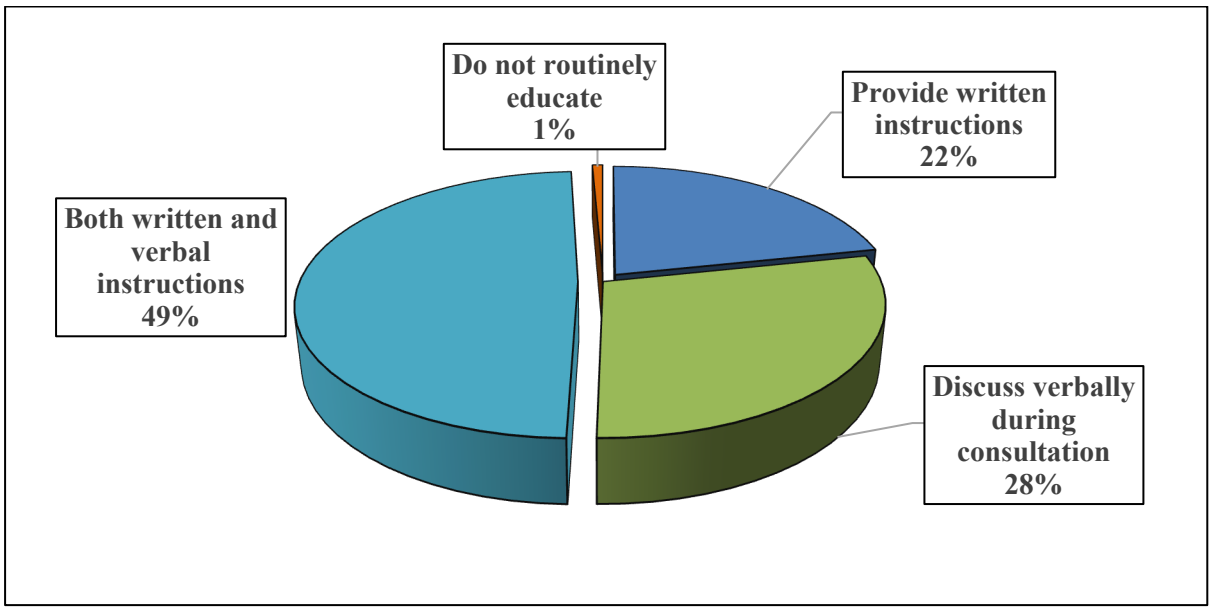

Figure 6: Patient knowledge on full course completion of cefpodoxime treatment

Notably, only 24 % of physicians have encountered cases of clostridium difficile-associated diarrhoea in patients treated with cefpodoxime proxetil. About 58.3% and 37.8% of physicians also manage dosing in special populations, such as those with renal impairment or obesity, by adjusting based on body weight or renal function, respectively. When asked about challenges in prescribing cefpodoxime proxetil, most HCPs stated that they did not experience any kind of challenge in prescribing cefpodoxime and also mentioned that the drug has demonstrated particular effectiveness as a convenient, twice-daily oral therapy, thus showing notable efficacy as a first-line empirical treatment in managing respiratory tract infections.

Discussion

This study was conducted to gain insights into using cefpodoxime proxetil, particularly in pediatric and adult populations, focusing on physician's perspectives and clinical decision-making processes. The main goal of this study was to assess the physician's opinions on cefpodoxime proxetil for pediatric and adult patients, evaluate their attitudes towards its management, and identify any concerns regarding its prescription.

Cefpodoxime is a third-generation cephalosporin recognized for broad-spectrum antibacterial activity; cefpodoxime targets gram-positive and gram-negative bacteria, including pathogens commonly associated with respiratory and urinary tract infections. The Indian guidelines (ICMR, NCDC, etc.) all recommend cefpodoxime proxetil as a first-line therapy for individuals who are hypersensitive or allergic to penicillin. [**8,9,10]** The extended plasma half-life of cefpodoxime, ranging from 1.9 to 3.7 hours, allows for twice-daily administration. In comparative studies, a twice-daily dose of cefpodoxime proxetil (equivalent to 100 to 400 mg of cefpodoxime) was proven to be as effective as a regimen of phenoxy methylpenicillin, which is taken 3 to 4 times daily for treating pharyngotonsillitis. **[**5]

In this study, when asked about how frequently cefpodoxime proxetil was prescribed, the majority of the HCPs (72.2%) answered "always," and the two main reasons for that were due to its effectiveness (63.8%) and good safety profile (23.2%). A study conducted by Zuck et al. compared the effectiveness of cefpodoxime proxetil (200 mg twice daily) and ceftriaxone (1 g daily) in patients with bronchopneumonia. After ten days of treatment, with follow-up evaluations on days 10 and 30, the success rates (defined as cured or improved) were 97.7% for cefpodoxime and 95.1% for ceftriaxone. Both antibiotics demonstrated comparable efficacy and tolerance in high-risk patients with community-acquired bronchopneumonia, although cefpodoxime had a slightly higher success rate. [11]

The third reason given by HCPs for choosing cefpodoxime was due to its cost effectiveness, this affordability allowed patients to complete their full course of antibiotic treatment, supporting better adherence and therapeutic outcomes. Similarly, the pharmacoeconomic study by Hendrickson JR, et al. and Destache CJ, et al. showed that a 10-day regimen of cefpodoxime proxetil was associated with lower costs for treating adverse effects and treatment failures than a 10-day regimen of amoxicillin/clavulanic acid in children. [12,13,14]

A majority of HCPs (79.5%) prioritized cefpodoxime proxetil as first-line choice as compared to other antibiotics. A study by Safran C, et al. and Bergogne-Berezin E, et al. also mentioned that cefpodoxime proxetil appeared to be efficacious and well tolerated and can be used as an antibiotic of first choice in the treatment of respiratory tract infections in adults and adolescents. [15,16] The data regarding the appropriateness of cefpodoxime proxetil for specific patient conditions indicated that 39.3% of healthcare professionals (HCPs) use cefpodoxime proxetil as an empirical treatment based on symptoms.

To ensure patients complete the entire treatment, 49.0% of physicians provided written and verbal instructions, emphasizing compliance strongly. For special populations, such as obese patients or those with renal impairment, 58.3% of physicians adjust the dose based on actual or adjusted body weight, highlighting a tailored approach in such cases. When managing patients with a history of penicillin allergy, 59.6% of physicians prescribed cefpodoxime proxetil with caution, suggesting careful monitoring of potential cross-reactivity.

Regarding the safety profile of cefpodoxime proxetil, 75.9% of respondents reported not encountering Clostridium difficile-associated diarrhea in their patients, highlighting the drug's tolerability and supporting its favorable safety profile. A study by Frampton et al. found that a 7- to 14-day course of cefpodoxime proxetil is generally well tolerated, with adverse events occurring in a minority of patients, mainly mild to moderate. Common side effects include gastrointestinal complaints and skin reactions, which are usually mild. Rarely, pseudomembranous colitis has been observed in post-marketing studies. [5]

The study has a few limitations. Sampling bias may be present, as it was conducted by people who may not represent all Indian HCPs. Response bias is also a concern, as self-reported data may reflect socially desirable answers rather than actual practices. But overall cefpodoxime proxetil has demonstrated particular effectiveness as a convenient, twice-daily oral therapy, showing notable efficacy as a first-line empirical treatment in managing respiratory tract infections.

Conclusion

The study offers insights into the prescribing practices, perceptions of efficacy, and safety considerations regarding cefpodoxime proxetil among healthcare providers (HCPs) in India. Cefpodoxime proxetil is commonly chosen for its broad-spectrum antibacterial activity, especially in the treatment of respiratory and urinary tract infections. HCPs value its effectiveness and patient tolerance, and its frequent selection over other antibiotics highlights a preference for its favourable pharmacokinetic profile and reliable outcomes in both paediatric and adult populations. These findings underscore the importance of ongoing vigilance in monitoring antibiotic use, aiming to balance efficacy with patient safety in prescribing cefpodoxime proxetil.

Acknowledgements

We extend our sincere gratitude to the healthcare professionals for their support in data collection, ensuring confidentiality and accuracy. We are thankful to Dr. Geethu & Dr. Aditi for their support. We are especially grateful to the patients whose medical information has greatly contributed to our understanding of the need and utilization of cefpodoxime proxetil.

References

1. Ikuta KS, Swetschinski LR, Aguilar GR, Sharara F, Mestrovic T, Gray AP, Weaver ND, Wool EE, Han C, Hayoon AG, Aali A. Global mortality associated with 33 bacterial pathogens in 2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet. 2022 Dec 17; 400(10369):2221-48.
2. World Health Organization. Pneumonia [Internet]. Available from: https://www.who.int/health-topics/pneumonia. Accessed 25 Oct 2024.
3. Troeger C, Forouzanfar M, Rao PC, Khalil I, Brown A, Swartz S, Fullman N, Mosser J, Thompson RL, Reiner RC, Abajobir A. Estimates of the global, regional, and national morbidity, mortality, and aetiologies of lower respiratory tract infections in 195 countries: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet Infectious Diseases. 2017 Nov 1; 17(11):1133-61.
4. Bergogne-Berezin E. Cefpodoxime proxetil in upper respiratory tract infections. Drugs. 1991 Oct; 42(Suppl 3):25-33.
5. Frampton JE, Brogden RN, Langtry HD, Buckley MM. Cefpodoxime proxetil: a review of its antibacterial activity, pharmacokinetic properties and therapeutic potential. Drugs. 1992 Nov; 44(5):889-917.

6. Fulton B, Perry CM. Cefpodoxime proxetil: a review of its use in the management of bacterial infections in paediatric patients. Paediatric drugs. 2001 Feb; 3:137-58.
7. Geddes AM. Cefpodoxime proxetil in the treatment of lower respiratory tract infections. Drugs. 1991 Oct; 42(Suppl 3):34-40.
8. Yoon YK, Park CS, Kim JW, Hwang K, Lee SY, Kim TH, Park DY, Kim HJ, Kim DY, Lee HJ, Shin HY. Guidelines for antibiotic use in adults with acute upper respiratory tract infections. Infection & chemotherapy. 2017 Dec 1; 49(4):326-52.
9. Chocas EC, Paap CM, Godley PJ. Cefpodoxime proxetil: a new, broad-spectrum, oral cephalosporin. Annals of Pharmacot herapy. 1993 Nov; 27(11):1369-77.
10. Aggarwal A, Rath S. Cefpodoxime—utility in respiratory tract infections and typhoid fever. The Indian Journal of Pediatrics. 2004 May; 71:413-5.
11. Zuck P, Rio Y, Ichou F. Efficacy and tolerance of cefpodoxime proxetil compared with ceftriaxone in vulnerable patients with bronchopneumonia. Journal of antimicrobial chemotherapy. 1990 Jan 1; 26(suppl_E):71-7.
12. Balfour JA, Benfield P. Cefpodoxime Proxetil: An Appraisal of its Use in Antibacterial Cost-Containment Programmes, as Stepdown and Abbreviated Therapy in Respiratory Tract Infections. PharmacoEconomics. 1996 Aug; 10(2):164-78.
13. Hendrickson JR, North DS. Pharmacoeconomic Benefit of Antibiotic Step-Down Therapy: Converting Patents from Intravenous Ceftriaxone to Oral Cefpodoxime Proxetil. Annals of Pharmacotherapy. 1995 Jun; 29(6):561-5.
14. Destache CJ, Elsasser GN, Shinn BW. Assessment of pharmaceutical intervention in community-acquired pneumonia: intravenous ceftriaxone switching to oral cefpodoxime. Pharmacotherapy. 1995; 15:377.
15. Safran C. Cefpodoxime proxetil: dosage, efficacy and tolerance in adults suffering from respiratory tract infections. Journal of antimicrobial chemotherapy. 1990 Jan 1; 26(suppl_E):93-101.
16. Bergogne-Berezin E. Cefpodoxime proxetil in upper respiratory tract infections. Drugs. 1991 Oct; 42(Suppl 3):25-33.