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# PHARMACOECONOMIC ANALYSIS IN THE TREATMENT OF URINARY TRACT INFECTION IN INDIAN SCENARIO

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## ABSTRACT

### INTRODUCTION

Pharmacoeconomics is the branch of health economics that evaluates the **costs and outcomes of pharmaceutical interventions** to determine the most efficient use of healthcare resources. It compares alternative drug therapies in terms of cost, clinical effectiveness, and overall impact on quality of life. In infectious diseases such as urinary tract infections (UTIs), pharmacoeconomic evaluation is particularly important because inappropriate antimicrobial use can lead to treatment failure, prolonged illness, increased hospitalization, and antimicrobial resistance.[1,2,3]

**KEYWORDS:** Pharmacoeconomics, Urinary tract infections, Antimicrobial therapy, Healthcare resource utilization.

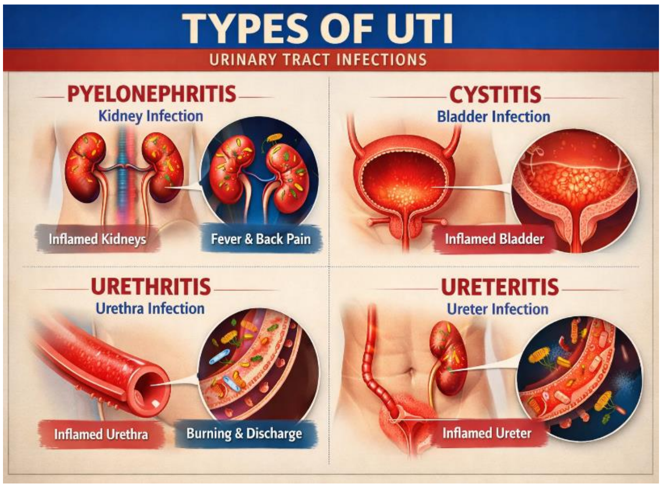



**Figure 1: Types of urinary tract infection.**

## EPIDEMIOLOGY

Urinary tract infections (UTIs) remain a major public health problem in India, contributing significantly to antimicrobial use in both community and hospital settings. Recent Indian studies continue to show a **higher prevalence in females**, with infections occurring across all age groups but more commonly in adults.[4]

Microbiologically, *Escherichia coli* remains the **predominant uropathogen**, followed by *Klebsiella* and other gram-negative organisms.[5] Recent Indian data also highlight a growing burden of **multidrug-resistant (MDR) and ESBL-producing uropathogens**, which complicates treatment and increases healthcare costs.[4,6]

Overall, current epidemiological trends in India emphasize the high burden of UTI, persistent dominance of *E. coli*, and rising antimicrobial resistance, underscoring the need for **targeted and cost-effective antibiotic therapy**.

## MICROBIOLOGICAL PROFILE OF UTI (ICMR-BASED ANALYSIS)

### Urine Culture

Urine culture is the **gold standard for the diagnosis of urinary tract infections**, as it enables accurate identification of the causative organism and determination of antimicrobial susceptibility. A bacterial count of $\geq 10^5$ colony-forming units (CFU)/mL is generally considered significant, although lower counts may be clinically relevant in symptomatic patients. Proper sample collection prior to initiation of antibiotic therapy is essential to ensure reliable results and guide targeted treatment.[7–9]

### Dominant Group of Pathogens

- Enterobacteriaceae → **73.2%** (major contributor)

### Within Enterobacteriaceae

- *Escherichia coli* → **49.24%** (predominant)
- *Klebsiella spp.* → **17.44%**
- *Proteus spp.* → **1.4%**
- *Citrobacter spp.* → **1.3%**

### Other Significant Pathogens

- *Enterococcus spp.* → **10.9%**
- Non-fermenting gram-negative bacilli → **8.2%**
- *Staphylococcus aureus* → **0.9%**

## EXISTING PHARMACOECONOMIC ANALYSIS STUDIES

Urinary tract infections (UTIs), most caused by *Escherichia coli*, represent a major indication for antibiotic therapy and contribute significantly to healthcare expenditure worldwide (10). In India, where out-of-pocket healthcare spending is high, the cost of antimicrobial therapy plays a crucial role in determining treatment accessibility and patient adherence.

Several studies have demonstrated substantial **cost variation among different brands of the same antibiotics and cost comparison among the generic and the brand has performed.**[11,12,13] Such variations can lead to unnecessary financial burden on patients without providing additional clinical benefit.

However, the majority of these studies are **not disease-specific** and do not incorporate microbiological confirmation of infection. As a result, their applicability to real-world clinical decision-making remains limited. In routine practice, antibiotic therapy for UTI is often empirical, which may lead to inappropriate drug selection, treatment failure, and increased overall cost due to the need for additional investigations and second-line therapies.[14]

## NOVELTY AND GAP ADDRESSED IN PRESENT STUDY

The present study addresses this important gap by focusing specifically on **culture-confirmed *Escherichia coli* urinary tract infections** and evaluating **brand-wise cost variation among culture-sensitive antibiotics**. By integrating microbiological data with pharmacoeconomic analysis, this study ensures that cost comparisons are restricted to clinically effective treatment options, thereby enhancing its practical relevance.

The findings of this study will have important implications for clinical practice, as they help in identifying the most **cost-effective antibiotic brands** among therapeutically equivalent options. This can promote **rational prescribing**, reduce unnecessary economic burden on patients, and improve medication adherence, particularly in resource-limited settings. Furthermore, such evidence supports **antimicrobial stewardship initiatives** by encouraging the selection of appropriate and economical antibiotics based on local susceptibility patterns.

Thus, the present study provides a **clinically relevant pharmacoeconomic perspective** by bridging the gap between microbiological diagnosis and cost-effective antibiotic selection, an area that remains inadequately explored in existing literature.

## METHEDOLOGY

Selection of Antibiotics to which 'E. coli' is Susceptible

↓

Collection of Brand-wise Price Data from India drug index and CIMS (Centralised Information Management System)

↓

Identification of Minimum and Maximum Price for each Drugs

↓

Calculation of Cost Variation (Pharmacoeconomic Analysis)

↓

Statistical Analysis (t-test)

↓

Interpretation and Comparison of Results

## STATISTICAL ANALYSIS

Statistical analysis was carried out using Microsoft Excel 2013. A paired *t*-test was employed to evaluate the differences in cost among various antibiotic brands. A *p*-value of $<0.05$ was considered to indicate statistical significance.

**RESULTS**

**1. MICROBIOLOGICAL PROFILE OF UTI (ICMR-BASED ANALYSIS)**

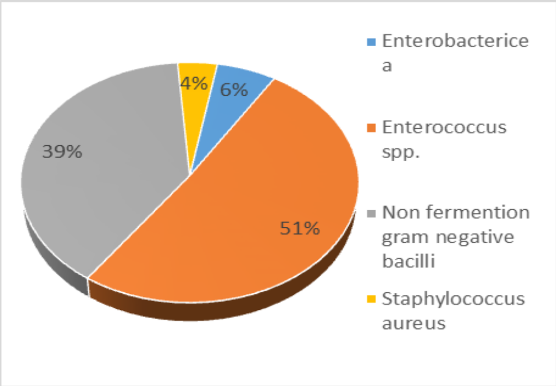
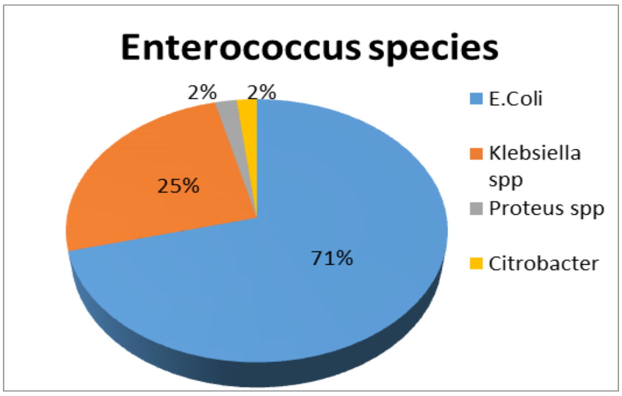



**FIGURE 2: ORGANISMS CAUSING UTI**




**GURE 3: ENTEROCOCCUS SPECIES**

**2. SELECTION OF COMMONLY PRESCRIBED ANTIBIOTICS**

**Table 1: Susceptibility percentage of Antibiotics used for UTI management in India.**

| Drug | Susceptibility (ICMR-BASED |
|---|---|
| **Fosfomycin** | 93.6% |
| **Nitrofurantoin** | 86.6% |
| **Trimethoprim-Sulfamethoxazole** | 45.6% |
| **Cefotaxime** | 47.1% |
| **Ceftriaxone** | 59.7% |
| **Gentamicin** | 74.3% |
| **Meropenem** | 86.9% |
| **Ciprofloxacin** | 24.5% |
| **Piperacillin-Tazobactam** | 76.7% |
| **Cefepime** | 48.1% |
| **Cefalexin** | 43% |

3. **COLLECTION OF BRAND-WISE PRICE DATA**

**Table 2: Comparative Analysis of Dosage Regimen and Treatment Course Cost Among Available Antibiotic Brands.**

| S. NO | DRUG/DOSE/ FREQUENCY/ DURATION | MANUFACTURER | BRAND | DOSAGE | DOSE | PER UNIT COST | PER DAY COST | COURSE COST |
|---|---|---|---|---|---|---|---|---|
| 1 | NITROFURANTOIN - 100mg (PO) - BD * 5 days | TABLETS | | | | | | |
| | | GSK | FURADANTIN | TAB | 100mg | 1 | 2 | 10 |
| | | INDSWIFT | NIFLERI | TAB | 100mg | 3.828 | 7.656 | 38.28 |
| | | RHOMBUS | NITFUR | TAB | 100mg | 3.893 | 7.786 | 38.93 |
| | | WALTER BUSHNELL | MARTIFUR | TAB | 100mg | 4.852 | 9.704 | 48.52 |
| | | OVERSEAS | URINIF | TAB | 100mg | 4.971 | 9.942 | 49.71 |
| | | INTAS | NIFTAS | TAB | 100mg | 13.4 | 26.8 | 134 |
| | | ALKEM | SAFTOIN | TAB | 100mg | 8.071 | 16.142 | 80.71 |
| | | | FURAKEM IR | TAB | 100mg | 7.181 | 14.362 | 71.81 |
| | | LA RENON | UTICHEK | TAB | 100mg | 7.3 | 14.6 | 73 |
| | | RED MED MEDICAL SEVICES | NIFTRED | TAB | 100mg | 7.3 | 14.6 | 73 |
| | | WILSHIRE HEALTH CARE | NIT BID | TAB | 100mg | 7.384 | 14.768 | 73.84 |
| | | SPLENZ PHARMACEUTICALS PVT.LTD | FURENZ | TAB | 100mg | 7.5 | 15 | 75 |
| | | EAST WEST PHARMA | INFURAN NF | TAB | 100mg | 7.604 | 15.208 | 76.04 |
| | | BHARAT SERUMS | NITRO F | TAB | 100mg | 7.656 | 15.312 | 76.56 |
| | | INDIABULLS PHARMACEUTICALS | NITROFEM | TAB | 100mg | 7.667 | 15.334 | 76.67 |
| | | TTK | FURENT | TAB | 100mg | 7.92 | 15.84 | 79.2 |
| | | LEEFORD HC | URIRON | TAB | 100mg | 7.92 | 15.84 | 79.2 |
| | | | URIVRON | TAB | 100mg | 7.92 | 15.84 | 79.2 |
| | | ASTRUM | URITOP | TAB | 100mg | 8 | 16 | 80 |
| | | LUPIN | NITROBEST | TAB | 100mg | 8.02 | 16.04 | 80.2 |
| | | RPG | INFURA | TAB | 100mg | 8.02 | 16.04 | 80.2 |
| | | MORAL NUTRA | UROSAFE | TAB | 100mg | 8.048 | 16.096 | 80.48 |
| | | VASU ORG | UTIRANTIN | TAB | 100mg | 8.075 | 16.15 | 80.75 |
| | | VIMAC HEALTHCARE | NITROPURE | TAB | 100mg | 8.6 | 17.2 | 86 |
| | | TORRENT | NFTOR | TAB | 100mg | 11 | 22 | 110 |
| | | ABBOTT | REZFURAN | TAB | 100mg | 14.519 | 29.038 | 145.19 |
| | | SAMARTH | NIFCLARE | TAB | 100mg | 18.177 | 36.354 | 181.77 |
| | | SUN | NIFTRAN-CP | TAB | 100mg | 8.769 | 17.538 | 87.69 |
| | | CAPSULE | | | | | | |
| | | ZYDUS | U FREE | CAP | 100mg | 4.137 | 8.274 | 41.37 |
| | | CIPLA | URIFAST CP | CAP | 100mg | 4.13 | 8.26 | 41.3 |
| | | | URIFAST | CAP | 100mg | 6.834 | 13.668 | 68.34 |
| | | MANKIND | URIFORCE | CAP | 100mg | 8 | 16 | 80 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | NITROBACT | CAP | 100mg | 7.82 | 15.64 | 78.2 |
| | | WEST COAST | NITRO | CAP | 100mg | 8 | 16 | 80 |
| | | SUN | NIFTRAN TM | CAP | 100mg | 8.259 | 16.518 | 82.59 |
| | | TROIKAA | TROYDANTIN | CAP | 100mg | 8.61 | 17.22 | 86.1 |
| | | TIDAL | UTISTAT DN | CAP | 100mg | 13.153 | 26.306 | 131.53 |
| | | MACLEODS | MACFURAN | CAP | 100mg | 6.8 | 13.6 | 68 |
| 2 | FOSFOMYCIN -3g - OD * Single dose | SACHET | | | | | | |
| | | MODI MUNDI | MONUROL | SACHET | 3g | 458 | 458 | 458 |
| | | ALNICHE LIFE SCIENCE | FOSFONA | SACHET | 3g | 360 | 360 | 360 |
| | | USV | UTIZAP | SACHET | 3g | 345 | 345 | 345 |
| | | BHARAT SERUMS | FLUDAFOS | SACHET | 3g | 314 | 314 | 314 |
| 3 | CEFTRIAXONE - 2g (IV) - OD * 5 days | **INJECTION** | | | | | | |
| | | ARISTO | MONOCEF | INJ | 2g | 139.19 | 139.19 | 695.95 |
| | | ALKEM | XONE | INJ | 2g | 143.06 | 143.06 | 715.3 |
| | | | TRAXOL | INJ | 2g | 128.56 | 128.56 | 642.8 |
| | | ZYDUS | MONOTAX | INJ | 2g | 138.13 | 138.13 | 690.65 |
| | | EMCURE | C TRI | INJ | 2g | 14.03 | 14.03 | 70.15 |
| | | GALPHA | ODICEF | INJ | 2g | 106 | 106 | 530 |
| | | MACLEODS | ACCUZON | INJ | 2g | 143.09 | 143.09 | 715.45 |
| | | SUN | OFRAMAX | INJ | 2g | 139 | 139 | 695 |
| | | MICRO | GRAMOCEF | INJ | 2g | 140.46 | 140.46 | 702.3 |
| | | RONYD HC | GREATCEF | INJ | 2g | 125.2 | 125.2 | 626 |
| | | AKUMENTIS | SUPERCEF | INJ | 2g | 140.46 | 140.46 | 702.3 |
| | | UNITED BIOTECH | UNITRAX | INJ | 2g | 134.59 | 134.59 | 672.95 |
| | | PSYCHOTROPICS | PILCEF | INJ | 2g | 143.09 | 143.09 | 715.45 |
| | | SANJIVINI BIOTECH | I TAX | INJ | 2g | 114.08 | 114.08 | 570.4 |
| 4 | CEFALEXIN - 500 mg - QID * 5 days | CAPSULE | | | | | | |
| | | SUN | CEFTOP | CAP | 500mg | 6.8 | 27.2 | 136 |
| | | | SPORIDEX | CAP | 500mg | 19.4 | 77.6 | 388 |
| | | GSK | PHEXIN | CAP | 500mg | 19.6 | 78.4 | 392 |
| | | LUPIN | CEFF | CAP | 500mg | 18.7 | 74.8 | 374 |
| | | CIPLA | CEPHADEX | CAP | 500mg | 15.8 | 63.2 | 316 |
| | | | SEPHADEX | CAP | 500mg | 15.8 | 63.2 | 316 |
| | | ALKEM | SEPHALKEM | CAP | 500mg | 14.1 | 56.4 | 282 |
| | | LEEFORD HC | CEPHY | CAP | 500mg | 5.1 | 20.4 | 102 |
| | | FINECURE PHARMA | CEFEL | CAP | 500mg | 10 | 40 | 200 |
| | | VIEW LAB | V FLEX | CAP | 500mg | 12 | 48 | 240 |
| | | ABBOTT | ROFEX | CAP | 500mg | 4.86 | 19.44 | 97.2 |
| | | ASSAM CHEMICAL | SEAFAX | CAP | 500mg | 10.8 | 43.2 | 216 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | APEX | LX | CAP | 500mg | 11.73 | 46.92 | 234.6 |
| | | ZYDUS | ORIPHEX | CAP | 500mg | 12.4 | 49.6 | 248 |
| | | | CEPHAXIN | CAP | 500mg | 16.2 | 64.8 | 324 |
| | | FRANKLIN | SPOROLIN | CAP | 500mg | 6.2 | 24.8 | 124 |
| | | ZENITH HC | ZENCEF | CAP | 500mg | 12.6 | 50.4 | 252 |
| | | INDSWIFT | CEFTOP | CAP | 500mg | 3.7 | 14.8 | 74 |
| | | QUE | Q CEF | CAP | 500mg | 10.5 | 42 | 210 |
| | | NOVARTIS | STAPHYDEX | CAP | 500mg | 3.3 | 13.2 | 66 |
| | | INTAS | INTACEPH | CAP | 500mg | 15.9 | 63.6 | 318 |
| | | LOBORATE | PHALEXIN | CAP | 500mg | 4.8 | 19.2 | 96 |
| | | | LABOCEPH | CAP | 500mg | 4.6 | 18.4 | 92 |
| | | DIAL | SEPHALIN | CAP | 500mg | 11.3 | 45.2 | 226 |
| | | GUJARAT TERCE | CEFTER | CAP | 500mg | 13.4 | 53.6 | 268 |
| | | TABLETS | | | | | | |
| | | RPG | NUFEX | TAB | 500mg | 25.2 | 100.8 | 504 |
| | | ATOPIC | DROXIPIC | TAB | 500mg | 14.4 | 57.6 | 288 |
| | | SHREEYAM | AVOCEF | TAB | 500mg | 14.2 | 56.8 | 284 |
| | | PRAYAS | BACTIFLEX | TAB | 500mg | 9.97 | 39.88 | 199.4 |
| | | ACRON PHARMA | BROXIN | TAB | 500mg | 27.6 | 110.4 | 552 |
| | | RAKVINA | SEPHEN | TAB | 500mg | 38.75 | 155 | 775 |
| | | RELIANCE FORMULATION | CEPHARIL | TAB | 500mg | 14.1 | 56.4 | 282 |
| | | LUPIN | CEFF | TAB | 500mg | 11.675 | 46.7 | 233.5 |
| | | ZYDUS | ORIPHEX | TAB | 500mg | 4.62 | 18.48 | 92.4 |
| | | FERVENT LIFESCIENCE PVT.L | LEXCEF | TAB | 500mg | 8.054 | 32.216 | 161.08 |
| | | EAST WEST PHARMA | MARCEF | TAB | 500mg | 11.8 | 47.2 | 236 |
| | | UNIMAX | CEPHAMAX | TAB | 500mg | 10.6 | 42.4 | 212 |
| | | LANARK LABOROTORIES | CEFRIK | TAB | 500mg | 11 | 44 | 220 |
| | | ADMIT | CEFAMIT | TAB | 500mg | 5.9 | 23.6 | 118 |
| | | NITIN PHARMAS | NIPHEX | TAB | 500mg | 10.5 | 42 | 210 |
| | | ELFIN PHARMA | CUCEF | TAB | 500mg | 2.6 | 10.4 | 52 |
| | | WIZAD BIOTECH | FEX | TAB | 500mg | 59.4 | 237.6 | 1188 |
| | | MEDI ORGANICS | Q CEF | TAB | 500mg | 54.9 | 219.6 | 1098 |
| | | ALPHA LAB | ALFEXIN | TAB | 500mg | 10.5 | 42 | 210 |
| | | ALLIANCE | ALCEF | TAB | 500mg | 38 | 152 | 760 |
| | | ABBOTT | MEXCEF | TAB | 500mg | 13.2 | 52.8 | 264 |
| | | LINCOLN | ALLSAFE | TAB | 500mg | 10.2 | 40.8 | 204 |
| | | SALVO HEALTHCARE | CEFASAL | TAB | 500mg | 3.8 | 15.2 | 76 |
| | | SOUTHSHOURNE | CEFORAL | TAB | 500mg | 3.84 | 15.36 | 76.8 |
| | | MANKIND | CEFASTAR | TAB | 500mg | 9.64 | 38.56 | 192.8 |

## 4. COMPARISON OF TREATMENT COURSE COST AMONG DIFFERENT BRANDS - NITROFURANTOIN TABLETS

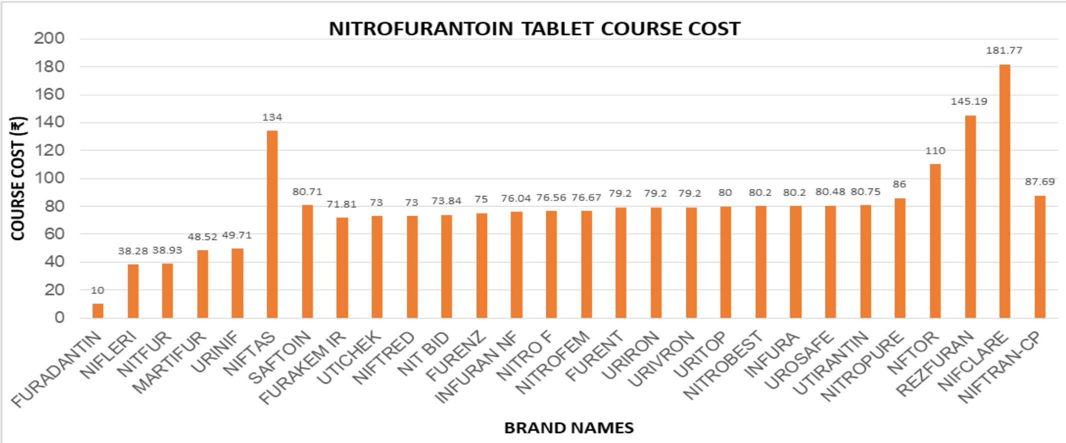



**Figure 4: Nitrofurantoin Tablet Course Cost.**

**Table 3: Brand-wise Cost Ranking and Statistical Significance Analysis - NITROFURANTOIN TABLET.**

| S. No | BRAND | COURSE COST | *p* -Value |
|---|---|---|---|
| 1. | FURADANTIN | 10 | 1.76028E-12 |
| 2. | NIFLERI | 38.28 | |
| 3. | NITFUR | 38.93 | |
| 4. | MARTIFUR | 48.52 | |
| 5. | URINIF | 49.71 | |
| 6. | FURAKEM IR | 71.81 | |
| 7. | UTICHEK | 73 | |
| 8. | NIFTRED | 73 | |
| 9. | NIT BID | 73.84 | |
| 10. | FURENZ | 75 | |
| 11. | INFURAN NF | 76.04 | |
| 12. | NITRO F | 76.56 | |
| 13. | NITROFEM | 76.67 | |
| 14. | FURENT | 79.2 | |
| 15. | URIRON | 79.2 | |
| 16. | URIVRON | 79.2 | |
| 17. | URITOP | 80 | |
| 18. | NITROBEST | 80.2 | |
| 19. | INFURA | 80.2 | |
| 20. | UROSAFE | 80.48 | |
| 21. | SAFTOIN | 80.71 | |
| 22. | UTIRANTIN | 80.75 | |
| 23. | NITROPURE | 86 | |
| 24. | NIFTRAN-CP | 87.69 | |
| 25. | NFTOR | 110 | |
| 26. | NIFTAS | 134 | |
| 27. | REZFURAN | 145.19 | |
| 28. | NIFCLARE | 181.77 | |

## 5. COMPARISON OF TREATMENT COURSE COST AMONG DIFFERENT BRANDS – NITROFURANTOIN CAPSULES

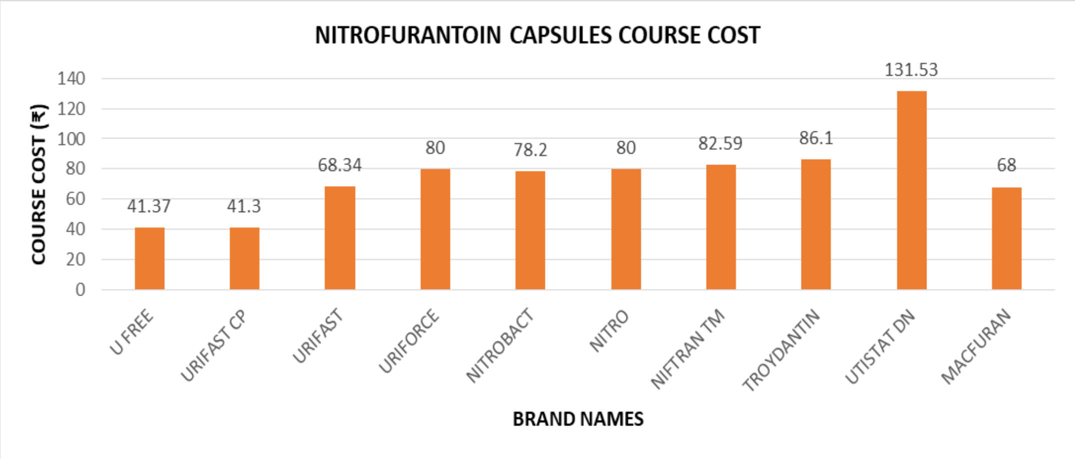



**Figure 5: Nitrofurantoin Capsules Course Cost.**

**Table 4: Brand-wise Cost Ranking and Statistical Significance Analysis - NITROFURANTOIN CAPSULE**

| S.NO | BRAND | COURSE COST | *P* -VALUE |
|---|---|---|---|
| 1. | URIFAST CP | 41.3 | 0.001269468 |
| 2. | U FREE | 41.37 | |
| 3. | MACFURAN | 68 | |
| 4. | URIFAST | 68.34 | |
| 5. | NITROBACT | 78.2 | |
| 6. | URIFORCE | 80 | |
| 7. | NITRO | 80 | |
| 8. | NIFTRAN TM | 82.59 | |
| 9. | TROYDANTIN | 86.1 | |
| 10. | UTISTAT DN | 131.53 | |

## 6. COMPARISON OF TREATMENT COURSE COST AMONG DIFFERENT BRANDS – FOSFOMYCIN SASCHET

**Table 5: Brand-wise Cost Ranking and Statistical Significance COURSE COST Analysis - FOSFOMYCIN SACHETS.**

| S. no | BRAND | COURSE COST | *p* -Value |
|---|---|---|---|
| 1. | FLUDAFOS | 314 | 0.198568608 |
| 2. | UTIZAP | 345 | |
| 3. | FOSFONA | 360 | |
| 4. | MONUROL | 458 | |

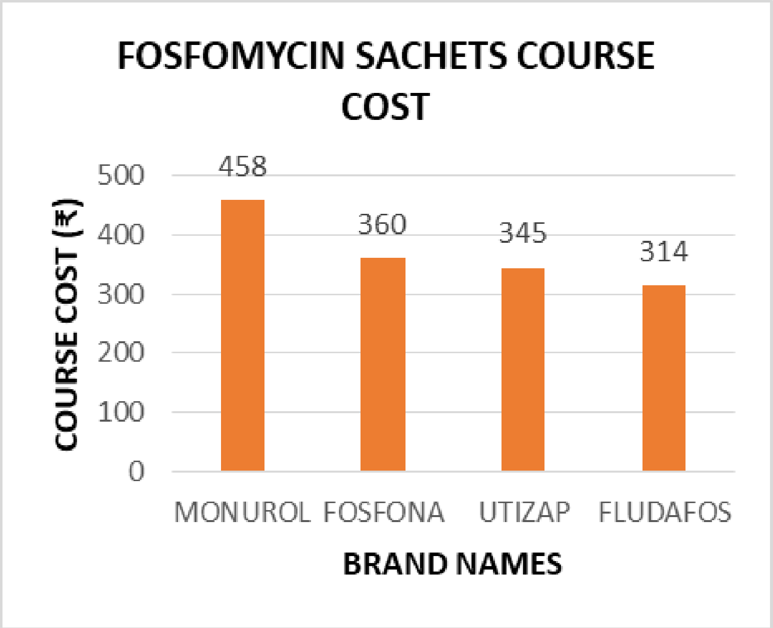



**FIGURE 6: FOSFOMYCIN SACHETS.**

**7. COMPARISON OF TREATMENT COURSE COST AMONG DIFFERENT BRANDS – CEFTRIAXONE INJECTION**

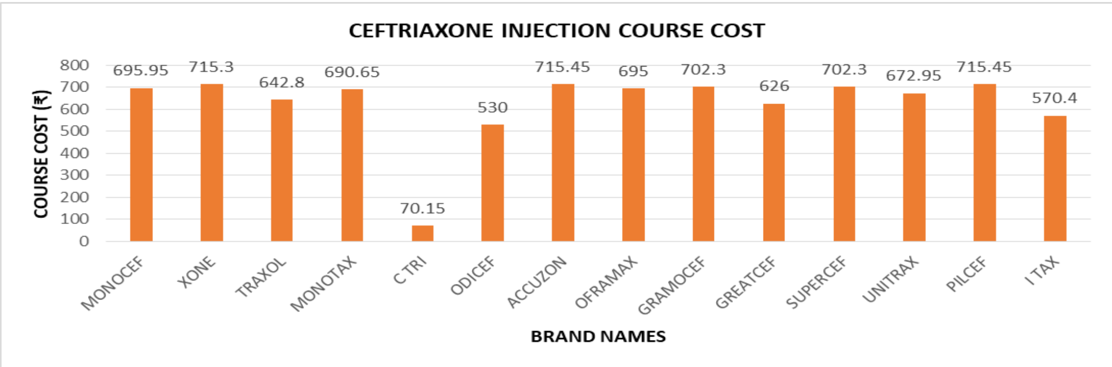



**FIGURE 7: CEFTRIAXONE INJECTION COURSE COST.**

**Table 6: Brand-wise Cost Ranking and Statistical Significance Analysis – CEFTRIAXONE INJECTION**

| S. No | BRAND | COURSE COST | *p* -Value |
|---|---|---|---|
| 1. | C TRI | 70.15 | 9.3504E-08 |
| 2. | ODICEF | 530 | |
| 3. | I TAX | 570.4 | |
| 4. | GREATCEF | 626 | |
| 5. | TRAXOL | 642.8 | |
| 6. | UNITRAX | 672.95 | |
| 7. | MONOTAX | 690.65 | |
| 8. | OFRAMAX | 695 | |
| 9. | MONOCEF | 695.95 | |
| 10. | GRAMOCEF | 702.3 | |
| 11. | SUPERCEF | 702.3 | |
| 12. | XONE | 715.3 | |
| 13. | ACCUZON | 715.45 | |
| 14. | PILCEF | 715.45 | |

## 8. COMPARISON OF TREATMENT COURSE COST AMONG DIFFERENT BRANDS – CEPHALEXIN CAPSULE

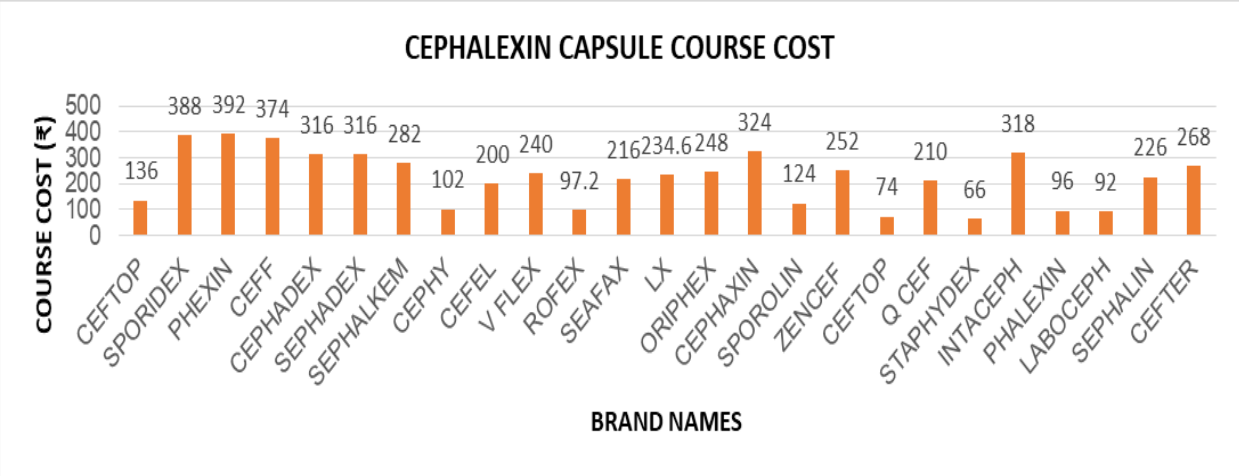



**FIGURE 8: CEPHALEXIN CAPSULE COURSE COST.**

**TABLE 7: Brand-wise Cost Ranking and Statistical Significance Analysis - CEPHALEXIN CAPSULE**

| S.NOz | BRAND | COURSE COST | *p* -Value |
|---|---|---|---|
| 1. | STAPHYDEX | 66 | |
| 2. | CEFTOP | 74 | |
| 3. | LABOCEPH | 92 | |
| 4. | PHALEXIN | 96 | |
| 5. | ROFEX | 97.2 | |
| 6. | CEPHY | 102 | |
| 7. | SPOROLIN | 124 | |
| 8. | CEFTOP | 136 | |
| 9. | CEFEL | 200 | |
| 10. | Q CEF | 210 | |
| 11. | SEAFAX | 216 | |
| 12. | SEPHALIN | 226 | |
| 13. | LX | 234.6 | 8.47609E-08 |
| 14. | V FLEX | 240 | |
| 15. | ORIPHEX | 248 | |
| 16. | ZENCEF | 252 | |
| 17. | CEFTER | 268 | |
| 18. | SEPHALKEM | 282 | |
| 19. | CEPHADEX | 316 | |
| 20. | SEPHADEX | 316 | |
| 21. | INTACEPH | 318 | |
| 22. | CEPHAXIN | 324 | |
| 23. | CEFF | 374 | |
| 24. | SPORIDEX | 388 | |
| 25. | PHEXIN | 392 | |

## 9. COMPARISON OF TREATMENT COURSE COST AMONG DIFFERENT BRANDS – CEPHALEXIN TABLET

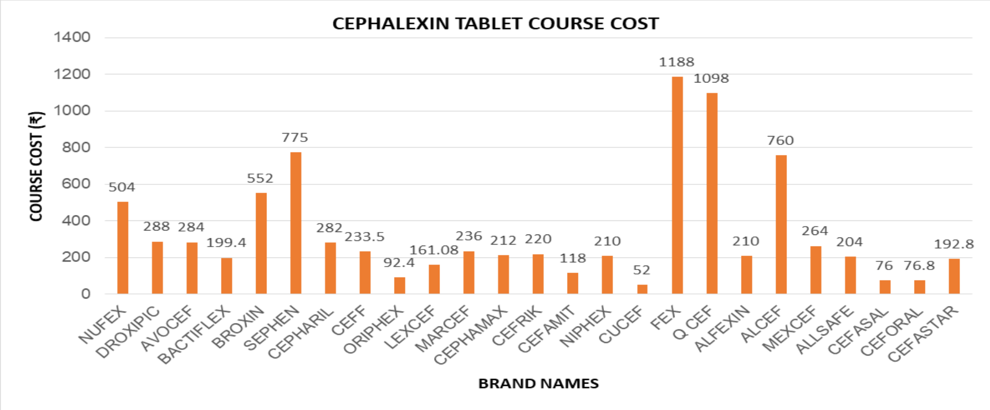



**FIGURE 9: CEPHALEXIN TABLET COURSE COST.**

**TABLE 8: Brand-wise Cost Ranking and Statistical Significance Analysis - CEPHALEXIN TABLET**

| S.NO | BRAND | COURSE COST | *p* –Value |
|---|---|---|---|
| 1. | CUCEF | 52 | 0.000198963 |
| 2. | CEFASAL | 76 | |
| 3. | CEFORAL | 76.8 | |
| 4. | ORIPHEX | 92.4 | |
| 5. | CEFAMIT | 118 | |
| 6. | LEXCEF | 161.08 | |
| 7. | CEFASTAR | 192.8 | |
| 8. | BACTIFLEX | 199.4 | |
| 9. | ALLSAFE | 204 | |
| 10. | NIPHEX | 210 | |
| 11. | ALFEXIN | 210 | |
| 12. | CEPHAMAX | 212 | |
| 13. | CEFRIK | 220 | |
| 14. | CEFF | 233.5 | |
| 15. | MARCEF | 236 | |
| 16. | MEXCEF | 264 | |
| 17. | CEPHARIL | 282 | |
| 18. | AVOCEF | 284 | |
| 19. | DROXIPIC | 288 | |
| 20. | NUFEX | 504 | |
| 21. | BROXIN | 552 | |
| 22. | ALCEF | 760 | |
| 23. | SEPHEN | 775 | |
| 24. | Q CEF | 1098 | |
| 25. | FEX | 1188 | |

## MICROBIOLOGICAL PROFILE OF UTI (ICMR-BASED ANALYSIS)

The microbiological analysis of urinary tract infections (UTIs), based on data from the **Indian Council of Medical Research (ICMR)** surveillance reports, showed that **Enterobacteriaceae** were the dominant group of uropathogens, accounting for **73.2%** of total isolates. Among these, **Escherichia coli** was the most prevalent organism (49.24%), confirming its established role as the primary causative agent of UTIs.[15]

**Klebsiella spp.** (17.44%) represented the second most common pathogen, while **Proteus spp.** (1.4%) and **Citrobacter spp.** (1.3%) were identified in smaller proportions. Among other organisms, **Enterococcus spp.** accounted for 10.9%, followed by non-fermenting gram-negative bacilli (8.2%) and **Staphylococcus aureus** (0.9%).[15]

## SELECTION OF COMMONLY PRESCRIBED ANTIBIOTICS

The selection of antibiotics included in the present study was guided by antimicrobial susceptibility trends reported in Indian surveillance studies and national guidelines. Multicentric data demonstrate that **fosfomycin** and **nitrofurantoin** retain high activity against uropathogenic *Escherichia coli*, with susceptibility rates exceeding 85–90%, supporting their continued recommendation as first-line agents for uncomplicated urinary tract infections (UTIs) in India.[16] Their preserved efficacy is attributed to limited resistance development and high urinary drug concentrations, making them reliable empirical choices.

In contrast, cephalosporins demonstrated variable susceptibility depending on resistance mechanisms. Studies evaluating urinary isolates reported that **ceftriaxone** remains highly effective against non-ESBL producing *E. coli*, showing superior activity compared with fluoroquinolones such as ciprofloxacin.[18] Similarly, antibiogram analyses identified ceftriaxone as a high-activity secondary antibiotic for acute symptomatic UTIs, outperforming several alternative agents.[19] Oral cephalosporins such as **cefalexin** showed moderate susceptibility; however, they were reported to maintain better safety and efficacy compared with cotrimoxazole and quinolones in selected patient populations.[17]

The observed susceptibility differences justify the inclusion of nitrofurantoin, fosfomycin, ceftriaxone, and cefalexin in the present pharmacoeconomic comparison. While nitrofurantoin and fosfomycin represent preferred empirical oral therapies, cephalosporins continue to serve as alternative options based on culture sensitivity patterns and clinical severity. These findings highlight the importance of aligning antibiotic selection with regional antibiogram data to optimize therapeutic outcomes and reduce antimicrobial resistance.

## ANALYSIS OF TREATMENT COURSE COST AMONG DIFFERENT BRANDS

### Nitrofurantoin Tablets

The present analysis demonstrated significant variation in treatment course cost among nitrofurantoin 100 mg tablet brands despite identical dosing regimens. The lowest course cost was observed with **Furadantin** (₹10), representing the most affordable option, whereas **Nifclare** showed the highest treatment cost (₹181.77). Statistical analysis confirmed a highly significant difference among brands ($p = 1.76 \times 10^{-12}$). These findings indicate substantial intra-brand price variability, which may directly influence treatment affordability without affecting therapeutic efficacy.

### Nitrofurantoin Capsules

The analysis of nitrofurantoin 100 mg capsule brands demonstrated notable variation in treatment course cost despite identical dosage and duration. The lowest course cost was observed with **Urifast CP** (₹41.3), while **Utistat DN** showed the highest cost (₹131.53). Statistical evaluation indicated a significant difference among brands ($p = 0.0012$), confirming meaningful pricing variability. These findings emphasize considerable intra-brand cost differences that may influence treatment affordability without impacting therapeutic effectiveness.

### Fosfomycin Sachets

The analysis of fosfomycin 3 g sachet formulations demonstrated a comparatively narrow variation in treatment course cost among available brands. The lowest cost was observed with **Fludafos** (₹314), followed by **Utizap** (₹345) and **Fosfona** (₹360), while **Monurol** showed the highest course cost (₹458). Although a price difference of ₹144 was identified between the least and most expensive brands, statistical analysis showed no significant cost variation (p =

0.1985). This indicates relatively uniform pricing among fosfomycin brands; however, selection of lower-cost brands may still reduce patient expenditure without affecting therapeutic regimen.

**Ceftriaxone Injection**

The cost analysis of ceftriaxone injection brands demonstrated substantial variation in treatment course cost despite identical dosage regimens. The lowest course cost was observed with **C-Tri** (₹70.15), whereas **Accuzon** and **Pilcef** showed the highest cost (₹715.45). Most brands were clustered within the higher price range, indicating wide intra-brand pricing differences. Statistical analysis confirmed a highly significant variation among brands ($p = 9.35 \times 10^{-8}$). These findings highlight considerable cost disparities that may influence treatment affordability while maintaining equivalent therapeutic outcomes.

**Cephalexin Capsules**

The cost comparison of cephalexin capsule brands revealed marked variability in treatment course cost despite identical therapeutic dosing. The lowest course cost was observed with **Staphydex** (₹66), while **Phexin** demonstrated the highest cost (₹392). A wide distribution of prices was noted across brands, indicating substantial intra-brand cost differences within the same formulation. Statistical analysis showed a highly significant variation among brands ($p = 8.47 \times 10^{-8}$). These findings highlight considerable pricing disparities that may influence patient affordability and prescribing decisions without altering clinical efficacy.

**Cephalexin Tablets**

The analysis of cephalexin tablet brands demonstrated substantial variation in treatment course cost among different manufacturers despite identical therapeutic composition. The lowest course cost was observed with **Cucef** (₹52), whereas **Fex** showed the highest cost (₹1188), indicating an extensive price range across brands. Several mid-range brands clustered between ₹150–₹300, while a few premium brands exhibited markedly elevated costs. Statistical evaluation confirmed a significant difference in pricing among brands ($p = 0.00019$). These findings emphasize pronounced cost disparities within cephalexin tablets, which may directly affect treatment affordability and rational drug selection in clinical practice.

**LIMITATIONS OF THE STUDY**

- The study evaluated **only cost variation** among brands and did not assess clinical outcomes.
- Price comparison was based on **available market prices at a specific time period**; drug prices may vary due to future price revisions.

**APPROACHES TO PREVENT RECURRENT UTI**

Prebiotics and probiotics suppositories and douches are used in prevention of recurrent UTI. Some studies show decrease recurrence, but results are inconsistent and not strong. In contrast, prebiotics and probiotics play a beneficial role in UTI management by promoting growth of protective bacteria such as Lactobacillus rhamnosus, which inhibit uropathogens like Escherichia coli through acidification of the vaginal environment, production of antimicrobial substances, and prevention of bacterial adhesion; thus they are mainly used as adjuncts to prevent recurrent UTIs rather than as primary treatment.[20,21,22,23] In relation of using prebiotics and probiotics in management of recurrent UTI studies shows superior efficacy of suppositories are found,[24] and studies shows certain negative impacts – such as altered microbiome, increase in risk of cervical and ovarian cancer and altered reproductive health of using douches in this case,[25,26,27,28,29] due to insufficient evidence and risk of negative impacts douches are generally replaced by suppositories in several guidelines.

## CONCLUSION

A pharmacoeconomic analysis was performed comparing brand-wise antibiotics used in the treatment of urinary tract infection caused by E. coli, the most prevalent pathogen. The study demonstrated that among the evaluated antibiotics—nitrofurantoin tablets, nitrofurantoin capsules, ceftriaxone injection, cephalexin capsules, and cephalexin tablets—there was a statistically significant and fosfomycin sachet was insignificant. These findings highlight the importance of selecting economically optimal antibiotic brands by the healthcare professionals.

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