

ANALYSIS OF PRESCRIPTION PATTERNS AND ADVERSE DRUG REACTIONS IN REPRODUCTIVE-AGE WOMEN (15–44 YEARS) WITH URINARY TRACT INFECTIONS: A RETROSPECTIVE STUDY FROM CENTRAL INDIA

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ABSTRACT

Objectives: Analysis of drug prescription patterns used in the treatment of urinary tract infection among the reproductive age groups, which is between 15 and 44 years. Analysis of adverse effects of drugs prescribed in urinary tract infection (UTI) among reproductive age groups of patients aged between 15 and 44 years to be studied.

Methods: This retrospective study analyzed records of 47 female UTI patients (15–44 years) over 18 months in a rural Central Indian hospital. It assessed prescription patterns, data completeness, antibiotic trends, and ADRs. Descriptive frequency and percentage was performed; no inferential statistics were conducted.

Results: Nitrofurantoin (63.83%) was the most commonly prescribed antibiotic for UTIs, followed by fluoroquinolones (14.9%) and fosfomycin (10.64%). Supportive therapies, such as Lactobacillus and sodium bicarbonate, were frequently co-prescribed. Significant prescription faults were detected with high frequency in dosage form (95.74–100%), amount, and duration. In 44% of patients, ADRs were found to occur, out of which the most frequent were diarrhea (40%). Medications such as amoxicillin-clavulanic acid and phenazopyridine presented with particular ADRs.

Conclusion: Nitrofurantoin must continue to be a first-line treatment for UTIs in the face of prescribing mistakes and high ADRs because improved monitoring of patient outcomes reinforces prescribing habits and will help counteract antimicrobial resistance.

Keywords: Adverse drug reactions, antimicrobial resistance, nitrofurantoin, reproductive age women, urinary tract infections.

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INTRODUCTION

Urinary tract infection (UTI) is the most frequent infection among women, especially those within the reproductive age category of 15–44 years. UTIs are more prevalent in this age group because of various anatomical, physiological, and hormonal reasons. UTIs may vary from simple cystitis to complex infections, including pyelonephritis, which, if not treated, can cause damage to the kidneys [1,2]. In India, UTIs are a major public health issue with a remarkable rate of incidence in women, especially those who are sexually active [3].

Recurrent UTIs typically need to be treated with antibiotics, and standard prescriptions are nitrofurantoin, trimethoprim-sulfamethoxazole, fosfomycin, and, in more complex infections, fluoroquinolones like ciprofloxacin [4]. Past research has examined the pattern of prescribing drugs for UTI treatment among women of reproductive age. A study by Muthukrishnan *et al.* in a tertiary care institution in India also reported that the most prescribed drugs for UTI treatment were nitrofurantoin, trimethoprim-sulfamethoxazole, and ciprofloxacin, whereas nitrofurantoin was often prescribed as a first option for uncomplicated UTI cases [5]. A study conducted by Kaur *et al.* also reported extensive use of fluoroquinolones in the case of complicated UTI infection, even after concerns regarding rising antimicrobial resistance (AMR) [3]. A study by Chou *et al.* in Taiwan similarly highlighted the over-reliance on empiric antibiotic treatment, especially for primary healthcare, where a more general-spectrum antibiotic like ciprofloxacin tended to be utilized, even though there were more targeted alternatives available [6]. These reviews highlight a

movement toward empirical treatment, which might be responsible for more resistance and side effects, particularly in younger women who tend to have recurring UTIs.

However, treatment of UTI is also made more difficult by the emergence of AMR. Studies have referred to growing resistance of uropathogens like *Escherichia coli* towards most commonly employed antibiotics, making it challenging to treat UTI [7,8]. Misuse and overuse of antibiotics have been termed as the major cause of this growing problem of AMR in India [9]. In addition, side effects of drugs (ADRs) of antibiotic therapy applied in the management of UTI are a cause for concern, particularly among women of childbearing age, who are also concerned about their impact on fertility and pregnancy. The ADRs, such as gastrointestinal upset, hypersensitivity reactions, and in some instances, systemic reactions, can have a significant effect on patient compliance with the therapy, resulting in delayed healing or worsening of the infection [10].

In spite of the prevalence of UTIs, few studies examine prescription trends and ADRs in Indian reproductive-age women. The current studies mainly evaluate the overall population or UTI pathogens but fail to capture prescribing trends and antibiotic safety in this group.

The study investigates antibiotic usage for UTI in women in 15–44 years age group at a Central Indian tertiary care hospital with respect to the adherence to clinical guidelines and corresponding ADRs. The findings will support antibiotic stewardship, enhance patient safety, and address AMR. Insights from this research will guide optimal UTI treatment and contribute to better management strategies in India.

METHODOLOGY

Study area and period

This research analyzed medical records of 47 rural female UTI patients between the ages of 15 and 44 years from a Central Indian rural tertiary care hospital for 18 months. Prescriptions and ADRs were evaluated employing the Daniel formula for sample size calculation and were statistically analyzed. Descriptive analysis was manually done. Percentage and frequency were computed to assess trends of prescribing and patterns of adverse drug reactions (ADRs). No inferential statistical analysis was utilized.

Study design

The study design was a retrospective observational study.

Data collection and procedure

This retrospective study will analyze medical records of 47 female UTI patients (15–44 years) from a Rural Tertiary Care Hospital in Central India. Data will be sourced from hospital records, including only those meeting the inclusion criteria. Patients outside this age range or with non-UTI conditions will be excluded from the study.

Table 1: Demographic parameters related to prescription data integrity for urinary tract infection female patients aged 15–44 years

Parameter	Category	Frequency	Percentage
Prescription Data Integrity [no. of patients (n)=47]	Name of the patient	47	100
	Age	47	100
	Weight	46	97.87
	Address	45	95.74
	Date	40	85.1
	medical registration number	47	100
	Diagnosis	47	100

Table 2: Drug prescription details

Parameter	Category	Frequency	Percentage
Drug prescription details	Drug name	47	100
	Dosage form	44	93.62
	Route	46	97.87
	Dose	44	93.62
	Frequency	42	89.36
	Duration	40	85.11
	Number of pills	39	82.98

Inclusion criteria

- Female patients aged between 15 and 44 years, representing the reproductive age group.
- Patients who had a confirmed clinical diagnosis of UTI as per the physician's notes or diagnostic records.
- Patients whose prescription records were complete, containing details of prescribed antibiotics, dosage, duration, and any documented ADRs.

Exclusion criteria

- Prescriptions with incomplete or missing information retrieved from the Medical Records Department (MRD) or Health Management Information System (HMIS), such as missing patient age, diagnosis, or medication details.
- Prescriptions that were not associated with a UTI diagnosis, i.e., if the infection treated was unrelated (e.g., respiratory or skin infections).

Ethical considerations

The study was approved by the Institutional Ethics Committee of Datta Meghe Institute of Higher Education and Research (Deemed to be University), with reference number DMIHER(DU)/IEC/2024/159.

RESULTS

Prescription data integrity

This study included a total of 47 outpatient prescription encounters. The completeness of individual prescriptions was evaluated before the prescribing indicator analysis. Table 1 shows that the date of prescription was noted on 40 prescriptions (85.1%) out of 47 prescriptions. The patient's name appeared on all prescriptions 47 (100%). Proper documentation was observed for age, medical registration number, and diagnosis. However, there were deficiencies in recording weight (2.13%) and patient address (5.32%).

Drug prescription details

The Table 2 shows the incompleteness of drug prescription information for female UTI patients. The drug name was included in all 47 prescriptions (100%). The dosage form was documented in 44 prescriptions (93.62%), and the route of administration appeared in 46 prescriptions (97.87%). The dose was specified in 44 prescriptions (93.62%), whereas the frequency was noted in 42 prescriptions (89.36%). The duration was recorded in 40 prescriptions (85.11%), and the number of pills was mentioned in 39 prescriptions (82.98%).

Antibiotic prescribing in UTI

Fig. 1 provides an overview of antibiotic prescribing patterns for UTIs. Among the different classes of antibiotics, nitrofurans (specifically nitrofurantoin 100 mg) were the most commonly prescribed, accounting for 63.83% of the prescriptions, reflecting its established efficacy and

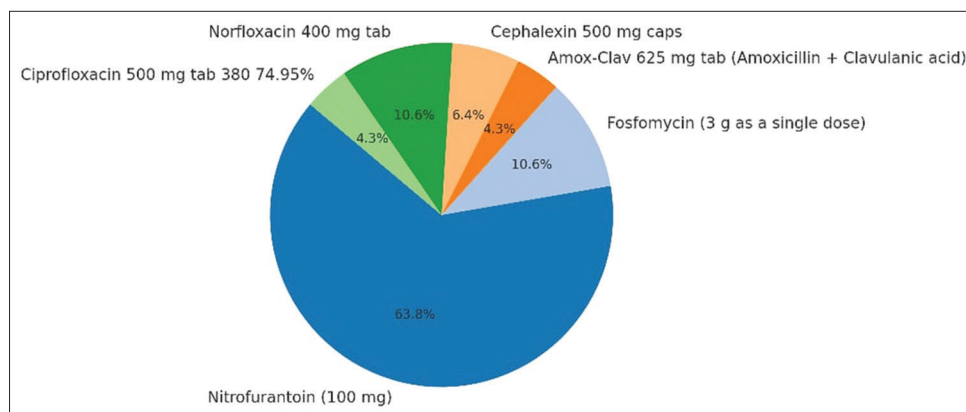
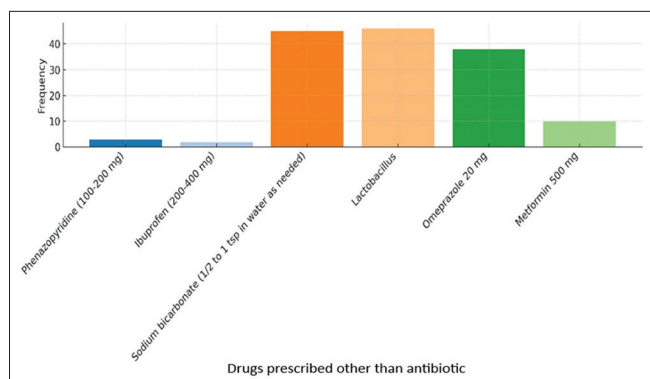
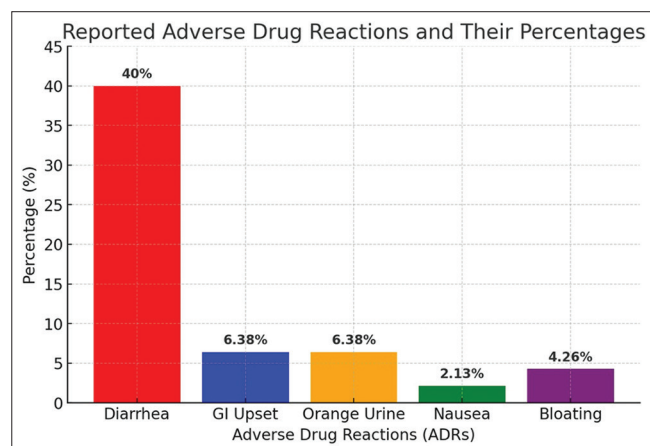


Fig. 1: Antibiotic prescribing in urinary tract infection

Table 3: Errors in antibiotic prescription

Parameter	Category	Frequency	Percentage
Errors in antibiotic prescription	Dosage form	47	100
	Drug quantities	47	100
	Route of administration	47	100
	Duration of therapy	45	95.74

**Fig. 2: Other drugs prescribed with antibiotics****Fig. 3: GI – Gastrointestinal**

safety profile for UTIs. Phosphonic acid derivatives (fosfomycin, 3 g as a single dose) constituted 10.64% of the prescriptions, highlighting its use as a convenient single-dose option.

Penicillin derivatives, represented by amoxicillin-clavulanic acid (Amox-Clav 625 mg), were prescribed less frequently, making up 4.26%, likely reserved for specific cases requiring broader coverage. Cephalosporins (Cephalexin 500 mg) had a moderate share of 6.38%, suggesting its utility in certain patients. Fluoroquinolones, including norfloxacin 400 mg and ciprofloxacin 500 mg, collectively accounted for 14.9% of prescriptions, reflecting their use in cases where first-line agents may not be appropriate or effective.

Overall, the data indicate a preference for Nitrofurantoin as the first-line treatment for UTIs, with other agents prescribed based on clinical need, resistance patterns, or patient factors.

Other drugs prescribed with antibiotics

The bar diagram (Fig. 2) highlights the frequency of drugs prescribed alongside antibiotics for treating UTIs. Lactobacillus (46 prescriptions) is the most frequently used, underscoring its importance in maintaining gut health and preventing antibiotic-associated side effects like diarrhea. Sodium bicarbonate (45 prescriptions) follows closely,

indicating its role as a urinary alkalizer to relieve symptoms such as a burning sensation during urination. Omeprazole (38 prescriptions) is also commonly prescribed, mainly to manage gastrointestinal issues or address conditions like acid reflux in patients.

On the other hand, metformin (10 prescriptions) is prescribed for patients with diabetes to maintain blood sugar control. Phenazopyridine (3 prescriptions) and ibuprofen (2 prescriptions) are the least prescribed, reflecting their selective use for pain management and symptomatic relief in specific cases. The diagram emphasizes the frequent use of supportive therapies, with lactobacillus and sodium bicarbonate being the most commonly prescribed.

Errors in antibiotic prescription

Table 3 examines errors in antibiotic prescriptions across four categories: dosage form, drug quantities, route of administration, and duration of therapy. Errors in dosage form, drug quantities, and route of administration were present in all 47 cases analyzed, making up 100% in each category. On the other hand, errors in the duration of therapy were found in 45 cases, which corresponds to 95.74%. This suggests that mistakes in prescribing the form, quantity, and method of drug delivery are ubiquitous, whereas errors in the duration of therapy, though slightly less common, are still highly prevalent.

ADRs across medications

ADRs in women of reproductive age (15–44 years) with UTIs can vary depending on the class of drugs used for treatment. The analysis of ADRs revealed various types and their distribution across drugs. This study found that at a tertiary care hospital in Central India, 44 % of women in the reproductive age group (15–44 years) had ADRs.

In the Fig. 3, diarrhea was the most commonly reported ADR, accounting for 40%, followed by gastrointestinal upset and orange urine, both at 6.38%, whereas nausea and bloating were reported less frequently at 2.13% and 4.26%, respectively.

The Fig. 4 highlighted specific drugs associated with ADRs. Amoxicillin-clavulanic acid and phenazopyridine were responsible for 100% of diarrhea and orange urine, respectively. Meanwhile, ibuprofen was responsible for 100% of gastrointestinal upset. Some medications, such as nitrofurantoin and cephalexin, were partly associated with diarrhea and gastrointestinal upset at 33.33%. Sodium bicarbonate was to blame for 4.44% bloating cases, whereas fosfomycin was responsible for 20% of cases that expressed nausea. This data brings out the various ADR profiles associated with other drugs and underscores the need for monitoring for various specific interactions during treatment.

DISCUSSION

The results of this study show important aspects of prescribing patterns and ADRs in the treatment of UTIs among reproductive-age women (15–44 years). Its high prescription rate, 63.83% compares well with its being one of the first-line treatments for UTIs that are uncomplicated due to its effectiveness and safety record [2]. The results concord with previous studies carried out in similar settings, including those of Muthukrishnan *et al.*, [11] and Kaur *et al.* [12] who specified nitrofurantoin as the most commonly prescribed antibiotic in UTI treatment.

The use of fosfomycin, at 10.64% as a one-time treatment, is an indication that its convenience and efficacy are enhanced, especially for patients in whom adherence to a multi-dose regimen would be difficult [13]. Though the moderate utilization of fluoroquinolones, including ciprofloxacin and norfloxacin, at 14.9% has garnered much attention by several studies that have warned on the risk of AMR [14]. While fluoroquinolones are effective for complicated UTIs, their use should be restricted in uncomplicated cases to preserve their efficacy against resistant pathogens.

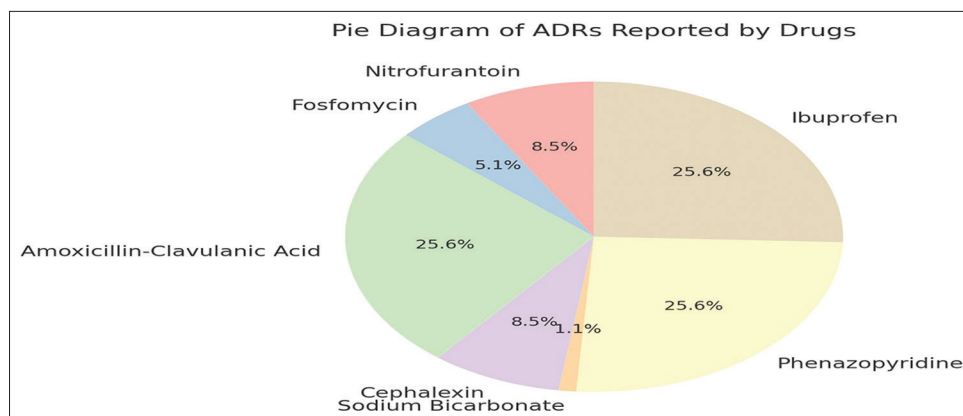


Fig. 4: Pie diagram of ADRs reported by drugs

Supportive therapies such as lactobacillus (97.87%) and sodium bicarbonate (95.74%) were frequently co-prescribed, reflecting their importance in reducing antibiotic-associated diarrhea and alleviating dysuria symptoms, respectively [15].

However, the use of proton pump inhibitors like omeprazole (80.85%) alongside antibiotics raises questions about potential overprescription, as this combination is not always necessary [16].

Significant errors in prescription documentation were noted, with 100% of cases showing inaccuracies in dosage form, drug quantities, and route of administration. Similar findings have been reported in other Indian studies, suggesting a broader systemic issue in prescription practices [17]. These errors may lead to suboptimal treatment, increased ADRs, or resistance development, underscoring the need for prescriber training and stricter adherence to prescription guidelines [18].

ADRs were reported in 44% of patients, with diarrhea being the most common (40%), primarily associated with amoxicillin-clavulanic acid. This aligns with findings from previous studies that report a high incidence of gastrointestinal ADRs with broad-spectrum antibiotics [19]. Other ADRs, such as orange urine with phenazopyridine and nausea with fosfomycin, although less frequent, highlight the importance of patient counseling to manage expectations and improve adherence to therapy.

The high prevalence of ADRs and errors in prescription documentation suggests the need for implementing antibiotic stewardship programs in rural settings. These programs can enhance prescriber awareness about appropriate antibiotic selection, improve adherence to evidence-based guidelines, and reduce the risk of AMR. Studies have shown that structured interventions, such as audit-and-feedback mechanisms and prescriber education, significantly improve prescription quality and reduce ADRs [20].

CONCLUSION

This study highlights key gaps in UTI management for reproductive-age women in rural India. While nitrofurantoin remains the first-line treatment, frequent fluoroquinolone use and inconsistent prescribing signal a need for stronger antibiotic stewardship. High prescribing errors, ADRs, and excessive supportive drug use emphasize the need for prescriber training, quality assurance, and pharmacovigilance.

Diarrhea was the most common ADR, suggesting lactobacillus supplementation with nitrofurantoin to improve adherence. Addressing these challenges requires adherence to guidelines, antimicrobial stewardship, and prescriber education to reduce AMR and optimize patient care. This research supports sustainable, evidence-based UTI management strategies.

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AUTHOR'S CONTRIBUTION

All authors made substantial contributions to the conception of the study, acquisition of data, analysis, and interpretation. All authors drafted and critically revised the manuscript. All gave their final approval for this version and accept responsibility for the report.

CONFLICT OF INTEREST

No.

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