Section: General Medicine

Original Research Article

ASSESSMENT OF ANTIBIOTIC PRESCRIBING PATTERNS IN A TERTIARY CARE CENTRE IN SOUTH GUJARAT: A PROSPECTIVE STUDY WITH WHO AWARE CLASSIFICATION

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ABSTRACT

Background: Antimicrobial resistance (AMR) is a major global public health threat driven largely by the irrational and excessive use of antibiotics. Antibiotic exposure promotes the selection and spreads of resistant microorganisms, leading to increased morbidity, mortality, healthcare costs, and prolonged hospital stays. The burden is particularly concerning in tertiary care hospitals, where broad-spectrum antibiotics are frequently used. The WHO AWaRe (Access, Watch, Reserve) classification provides a framework for promoting rational antibiotic use and recommends that at least 60% of antibiotic consumption should belong to the Access group. Therefore, monitoring antibiotic prescribing patterns and assessing their compliance with AWaRe recommendations are essential components of antimicrobial stewardship. The present study was undertaken to evaluate antibiotic prescribing patterns in a tertiary care centre in South Gujarat and assess their alignment with WHO AWaRe recommendations. The objective is to assess antibiotic usage patterns in a tertiary care hospital with respect to clinical indications and to analyse the type, dose, route, and number of antibiotics prescribed per patient across different departments. To classify all prescribed antibiotics according to the World Health Organization AWaRe classification.

Materials and Methods: This prospective observational study was conducted between May to July, 2024 among patients receiving antibiotics in a tertiary care hospital. Participants were selected using random sampling based on predefined inclusion criteria. Data regarding demographic profile, diagnosis, and antibiotic prescription details - type, dose, and route of administration, were collected using a structured proforma.

Results: Antibiotic utilisation was highest in the Departments of General Surgery and General Medicine. Ceftriaxone (25%) was the most frequently prescribed antibiotic. Prophylactic use accounted for 41% of prescriptions, with particularly high usage observed in surgical departments and haematological conditions (97%). Monotherapy was more common in Medicine (43%) and Paediatrics (56%), whereas surgical departments demonstrated higher rates of polypharmacy. Commonly prescribed antibiotics included Ceftriaxone, Amoxicillin-Clavulanate, Metronidazole, and Cefotaxime, while Amoxicillin, Ciprofloxacin, and Colistin were least utilised (≤1%). AWaRe classification showed predominant use of Watch antibiotics, lower use of Access agents, and minimal Reserve antibiotic use, indicating deviation from WHO prescribing targets.

Conclusion: The study identifies a high prevalence of broad-spectrum and prophylactic antibiotic use, along with deviations from recommended prescribing practices. These findings highlight the need for strengthened antimicrobial stewardship interventions, including institutional guidelines, regular prescription audits, and clinician training to promote rational antibiotic use and reduce antimicrobial resistance.
Keywords: Antibiotics, Antimicrobial resistance, AWaRe classification, Prophylaxis, Prescribing pattern.

INTRODUCTION

Microorganisms are an integral part of the human environment, with many existing as harmless or beneficial commensals. However, pathogenic microorganisms continue to contribute substantially to infectious diseases and remain an important cause of morbidity and mortality worldwide. The development of antibiotics transformed modern medicine by providing effective treatment for bacterial infections and substantially reducing deaths associated with previously life-threatening infectious diseases.[1,2]

The widespread availability and inappropriate use of antibiotics, however, have contributed to the emergence and dissemination of antimicrobial resistance (AMR), which is now recognized as a major global health challenge.[3,4] Exposure to antibiotics creates selective pressure that favours the survival and multiplication of resistant organisms. In addition, microorganisms can acquire resistance through genetic mechanisms and transmit resistance determinants to other microorganisms, further accelerating the spread of resistance.[5,6]

AMR has important clinical, economic, and social consequences. Resistant infections are associated with treatment failure, increased morbidity and mortality, prolonged hospitalization, higher healthcare expenditure, and the requirement for alternative or more costly antimicrobial agents.[7-13]

The problem is particularly relevant in tertiary care hospitals, where patients often have complex clinical conditions and are frequently exposed to broad-spectrum and empirical antimicrobial therapy. Such prescribing practices may increase selective pressure and contribute to the development and spread of multidrug-resistant organisms.

The relationship between antimicrobial consumption and resistance has been demonstrated at both individual and population levels.[14–18] Consequently, appropriate antimicrobial prescribing is an essential component of efforts to control AMR. Regular assessment of prescribing practices can help identify inappropriate antibiotic selection, excessive use of broad-spectrum agents, and deviations from recommended treatment practices.[7,8]

To promote rational antimicrobial use, the World Health Organization (WHO) developed the AWaRe (Access, Watch and Reserve) classification system. This framework categorizes antibiotics according to their spectrum of activity, importance in clinical practice, and potential to contribute to antimicrobial resistance. The WHO recommends that at least 60% of overall antibiotic consumption should come from the Access group, while Watch and Reserve antibiotics should be used judiciously and primarily when clinically indicated.

Antimicrobial stewardship programmes therefore emphasize appropriate antibiotic selection, dosage, route, and duration of therapy, together with continuous monitoring of antimicrobial utilization. Evaluation of antibiotic prescribing patterns using the WHO AWaRe classification can provide useful information regarding the quality and appropriateness of antimicrobial use within healthcare institutions. Such surveillance is particularly important in tertiary care settings, where antibiotic consumption is often substantial and prescribing practices can influence the local pattern of antimicrobial resistance.[7,8]

In view of the growing concern regarding AMR and the importance of rational antimicrobial utilization, the present study was undertaken to evaluate antibiotic prescribing patterns in a tertiary care centre in South Gujarat and assess the distribution of prescribed antibiotics according to the WHO AWaRe classification. The findings may help identify areas requiring improvement and support the development of targeted antimicrobial stewardship interventions.

MATERIALS AND METHODS

Study Design and Setting: This prospective observational study was conducted from May to July 2024 at the Surat Municipal Institute of Medical Education and Research (SMIMER), Surat, Gujarat, after obtaining approval from the Institutional Ethics Committee.

Study Population: The study included inpatients admitted to the Departments of General Medicine, General Surgery, Paediatrics, and ENT who were prescribed at least one antibiotic during their hospital stay.

Inclusion Criteria:

- Hospitalised patients receiving one or more antibiotics
- Patients willing to participate and provide informed consent

Exclusion Criteria:

- Patients not prescribed any antibiotics

Sampling Method: Participants were selected using random sampling based on predefined enrolment criteria.

Data Collection: Data were collected using a structured evaluation proforma after obtaining informed consent. Information was extracted from patient case records and included:

- Demographic details (age, sex)
- Inpatient department and ward
- Clinical diagnosis and comorbidities
- Indication for antibiotic use (therapeutic or prophylactic)
- Type of infection (e.g., urinary tract infection, pneumonia, skin and soft tissue infection, bone and joint infection, catheter-related infection, upper respiratory tract infection, undifferentiated fever, sepsis, or others)
- Details of antibiotic therapy:
- Name of antibiotic(s)
- Number of antibiotics prescribed per patient
- Dose and route of administration
- Appropriateness of dose (as per standard guidelines)
- Duration of hospital stay

Prophylactic antibiotic prescriptions were recorded separately and analysed.

AWaRe Classification Analysis: All prescribed antibiotics were categorised into Access, Watch, and Reserve groups according to the World Health Organization AWaRe classification. This classification was used to evaluate the rationality of antibiotic prescribing patterns in comparison with WHO-recommended targets.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using descriptive statistics. Results were expressed as frequencies, percentages, and proportions.

RESULTS

A total of 400 inpatients receiving antibiotic therapy were enrolled during the two-month study period. The demographic characteristics, department-wise distribution, clinical indications, antibiotic utilization patterns, and WHO AWaRe classification of prescribed antibiotics were evaluated.

Table 1: Demographic Characteristics and Department-wise Distribution of Study Participants (N = 400)

Parameter	Category	Frequency (n)	Percentage (%)
Gender	Male	220	55.0
	Female	180	45.0
Age	Neonatal (birth–<1 month)	0	0.0
	Infant (1 month–12 months)	20	5.0
	Toddler (1–<2 years)	8	2.0
	Early childhood (2–<6 years)	29	7.3
	Middle childhood (6–<11 years)	24	6.0
	Early adolescent (11–<16 years)	24	6.0
	Late adolescent (16–<18 years)	15	3.8
	Adult (18–<44 years)	157	39.3
	Middle age (44–<60 years)	64	16.0
	Elderly (60–<75 years)	33	8.3
	≥75 years	12	3.0
Ward	General Medicine	141	35.3
	General Surgery	127	31.8
	Paediatrics	114	28.5
	ENT	18	4.5
Diagnosis	Infectious	220	55.8
	Non-infectious	180	44.3

Among the 400 participants, 220 (55.0%) were male and 180 (45.0%) were female, indicating a slight male predominance. The largest age group was 18–<44 years, comprising 157 (39.3%) participants, followed by those aged 44–<60 years [64 (16.0%)]. Among the paediatric age groups, infants accounted for 20 (5.0%), early childhood for 29 (7.3%), middle childhood for 24 (6.0%), early adolescence for 24 (6.0%), and late adolescence for 15 (3.8%). No neonates were included.

Department-wise, the highest number of participants were from General Medicine [141 (35.3%)], followed by General Surgery [127 (31.8%)], Paediatrics [114 (28.5%)], and ENT [18 (4.5%)].

Antibiotic Utilisation Pattern:

Antibiotic utilization varied across the different clinical departments. Overall, ceftriaxone was the most frequently prescribed antibiotic, accounting for 25% of prescriptions.

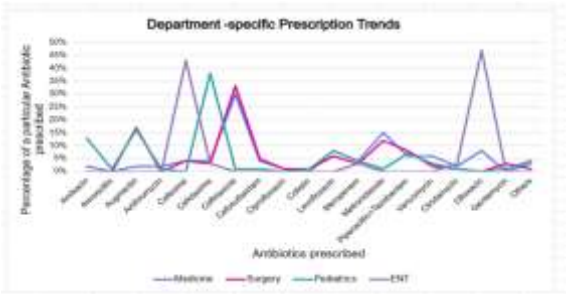

Figure 1: Department-wise Distribution of Antibiotic Prescribing Patterns

Department-specific prescribing patterns demonstrated that ceftriaxone was the most frequently prescribed antibiotic in both General Surgery (33%) and General Medicine (30%). It was followed by metronidazole, which accounted for 12% of prescriptions in General Surgery and 15% in General Medicine.

In General Medicine, other frequently prescribed antibiotics included ofloxacin (8%), levofloxacin (8%), vancomycin (6%), and piperacillin-tazobactam (6%). In General Surgery, amoxicillin-clavulanate (17%) and piperacillin-tazobactam (8%) were also commonly prescribed.

In Paediatrics, cefotaxime (38%) was the most frequently prescribed antibiotic, followed by amoxicillin-clavulanate (17%). In ENT, ofloxacin (47%) was the most commonly prescribed antibiotic, followed by cefixime (43%). Amoxicillin, ciprofloxacin, and colistin were among the least frequently used antibiotics, each accounting for ≤1%.

Prophylactic versus Therapeutic Use:

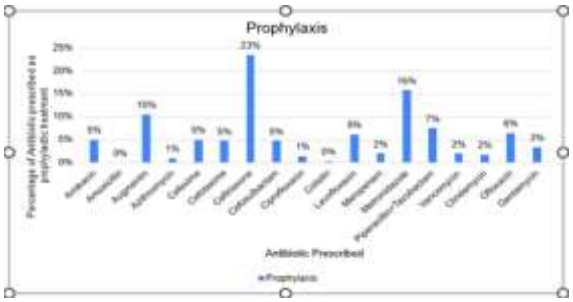

Figure 2: Distribution of Antibiotics Prescribed for Prophylactic Use

Of the total antibiotic prescriptions, 41% were administered for prophylactic purposes, while the remaining prescriptions were used therapeutically.

The highest proportion of prophylactic antibiotic use was observed in General Surgery (69%), followed by General Medicine (65%).

Among prophylactic prescriptions, ceftriaxone (23%) was the most frequently used antibiotic, followed by metronidazole (16%) and amoxicillin-clavulanate (10%). Amoxicillin and colistin were not used for prophylactic purposes.

System-wise Prescribing Trends:

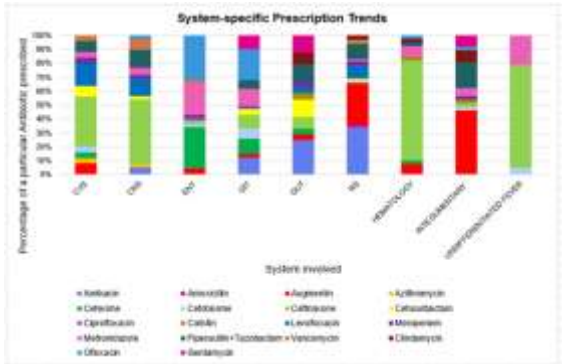

Figure 3: Distribution of Antibiotics Prescribed for Prophylactic Use

The proportion of prophylactic antibiotic use varied according to the affected organ system. The highest proportion was observed among patients with haematological conditions (97%), followed by cardiovascular conditions (78%) and genitourinary conditions (76%). The lowest proportion of prophylactic use was observed in integumentary conditions (5%).

Disease-specific Prescribing Patterns:

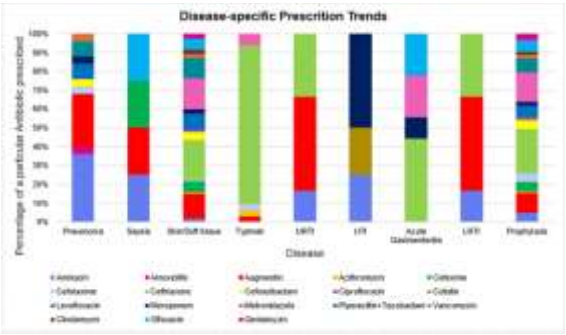

Figure 4: System-wise Distribution of Antibiotic Prescribing Patterns

Ceftriaxone was the most frequently prescribed antibiotic across several clinical systems, including cardiovascular (36%), central nervous system (46%), haematological (72%), and undifferentiated fever (74%) conditions.

Amoxicillin-clavulanate was predominantly prescribed for respiratory infections (30%), whereas metronidazole was commonly used for ENT-related infections (23%). No single antibiotic showed a consistent predominance for gastrointestinal and genitourinary conditions.

Number of Antibiotics per Patient:

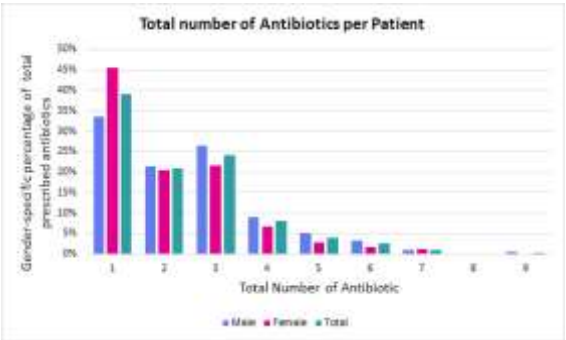

Figure 5: Antibiotic Prescribing Patterns According to Clinical Indications

Skin and soft-tissue infections represented the most common clinical indications for antibiotic therapy. Ceftriaxone accounted for 21% of antibiotic prescriptions for these infections.

Ceftriaxone was also the predominant antibiotic prescribed for typhoid fever (84%) and acute gastroenteritis (44%). For upper and lower respiratory tract infections, amoxicillin-clavulanate was the most frequently prescribed antibiotic.

Meropenem was commonly used for urinary tract infections, whereas amikacin (36%) and amoxicillin-clavulanate (28%) were the leading antibiotics prescribed for pneumonia.

Number of Antibiotics Prescribed per Patient

Among the 400 patients, 39% received a single antibiotic, while 21% received two antibiotics and 24% received three antibiotics. A smaller proportion

received four (8%) or five (4%) antibiotics during hospitalization.

Monotherapy was more frequently observed in General Medicine (43%) and Paediatrics (56%), whereas multiple-antibiotic therapy was more common in surgical departments. In ENT, 44% of patients received three antibiotics.

Gender-wise, 45% of male patients received more than three antibiotics compared with 35% of female patients.

Overall Antibiotic Usage Pattern:

Antibiotic	Percentage (%)
Ceftriaxone	25
Amoxicillin-clavulanate	11
Metronidazole	10
Cefotaxime	10
Piperacillin-tazobactam	7
Levofloxacin	7
Other antibiotics	Remaining

WHO AWaRe Classification

According to the WHO AWaRe classification, the majority of the prescribed antibiotics belonged to the Watch group. This included ceftriaxone, cefotaxime, fluoroquinolones such as ofloxacin and levofloxacin, and piperacillin-tazobactam.

The Access group included agents such as amoxicillin, amoxicillin-clavulanate, metronidazole, and amikacin and was comparatively less frequently utilized.

The Reserve group, including meropenem and colistin, was used less frequently and was restricted to selected clinical indications.

Overall, the findings demonstrated a predominance of Watch-group antibiotics, indicating substantial use of broad-spectrum agents in the study setting. The relatively lower utilization of Access-group antibiotics highlights an area for potential antimicrobial-stewardship intervention and the need to assess prescribing practices against WHO AWaRe recommendations.

DISCUSSION

The present prospective observational study provides an overview of antibiotic prescribing patterns among hospitalized patients in a tertiary care centre in South Gujarat. The study demonstrated considerable variation in antibiotic utilization across clinical departments and disease conditions. Ceftriaxone was the most frequently prescribed antibiotic (25%), while broad-spectrum antibiotics belonging predominantly to the Watch category constituted a substantial proportion of antimicrobial use. These findings highlight important areas for antimicrobial stewardship, particularly regarding antibiotic selection, prophylactic prescribing, use of multiple antibiotics, and adherence to the WHO AWaRe framework.

Antibiotic prescribing pattern: Ceftriaxone was the most frequently prescribed antibiotic in the present study, accounting for 25% of overall antibiotic use. Its utilization was particularly high in General Surgery (33%) and General Medicine (30%). The frequent use of ceftriaxone may be related to its broad antibacterial spectrum, convenient dosing schedule, and extensive availability in hospital practice. However, extensive use of third-generation cephalosporins may exert selective pressure favouring resistant organisms and may contribute to the emergence of antimicrobial resistance.[19,20]

The observed predominance of ceftriaxone is comparable with findings from other Indian hospital-based studies, in which third-generation cephalosporins have frequently been reported among the most commonly prescribed antibiotics.[19,20] Although ceftriaxone may be clinically justified for several serious bacterial infections, its routine empirical use should be guided by clinical indication, local antimicrobial susceptibility patterns, and institutional treatment guidelines.

Department-wise prescribing pattern

Antibiotic prescribing varied considerably between clinical departments. Ceftriaxone was predominant in General Medicine and General Surgery, whereas cefotaxime was the most frequently prescribed antibiotic in Paediatrics and ofloxacin was commonly used in ENT.

The relatively higher use of monotherapy observed in Medicine and Paediatrics may indicate that many patients were managed with a single antimicrobial agent; however, the number of antibiotics alone cannot be considered a direct indicator of rational prescribing. Appropriate antibiotic therapy depends on the indication, spectrum of activity, dose, route, duration, microbiological findings, patient characteristics, and clinical response.[21]

In contrast, multiple-antibiotic therapy was more frequently observed in surgical departments, particularly ENT. Combination therapy may be clinically appropriate in selected severe, polymicrobial, or complicated infections. Nevertheless, unnecessary combination therapy increases antimicrobial exposure and may increase the risk of adverse effects and selection of resistant organisms.[21,22] Therefore, antibiotic combinations should be regularly reviewed and de-escalated whenever clinically appropriate.

Prophylactic antibiotic use: An important finding of the present study was that 41% of antibiotic prescriptions were reported to be for prophylactic purposes. The highest proportion of prophylactic use was observed in General Surgery. Surgical antimicrobial prophylaxis has an established role in preventing surgical-site infections when used for appropriate procedures and administered at the recommended time and duration.[22,23]

However, the proportion of prophylactic prescribing should not be interpreted as inappropriate solely on the basis of its frequency. The appropriateness of prophylaxis depends on the type of surgical procedure, patient-related risk factors, choice of antibiotic, timing of administration, and duration of therapy.[22,23] Nevertheless, the substantial use

observed in the present study warrants further prescription-level assessment to determine whether prophylactic antibiotic use was consistent with procedure-specific guidelines.

Excessive duration or unnecessary continuation of prophylactic antibiotics may increase antimicrobial exposure without providing additional clinical benefit. Implementation of standardized surgical prophylaxis protocols, prescription audits, and regular feedback to clinicians may therefore help optimize antibiotic use.[22,23]

System-wise and disease-specific prescribing: The study demonstrated considerable variation in antibiotic use according to the clinical system involved. The highest proportions of prophylactic antibiotic use were observed in haematological, cardiovascular, and genitourinary conditions, whereas the lowest proportion was observed in integumentary conditions.

These findings should be interpreted cautiously because the requirement for prophylactic antibiotics differs according to the underlying clinical condition and procedure. A high proportion of prophylactic use in a particular clinical category does not necessarily indicate inappropriate prescribing. Nevertheless, such variation provides an opportunity for detailed prescription review and comparison with evidence-based guidelines.

Ceftriaxone was frequently prescribed for several clinical conditions, including skin and soft-tissue infections, typhoid fever, and acute gastroenteritis. Amoxicillin-clavulanate was commonly prescribed for respiratory infections, while meropenem was used in urinary tract infections and amikacin and amoxicillin-clavulanate were frequently prescribed for pneumonia.

The use of broad-spectrum antibiotics across multiple clinical indications emphasizes the importance of diagnosis-directed and microbiology-guided therapy. Where microbiological results are available, empirical broad-spectrum therapy should be reassessed and narrowed to the most appropriate effective agent whenever possible.[21,24]

Use of broad-spectrum and higher-generation antibiotics: The present study demonstrated considerable use of broad-spectrum antibiotics, particularly third-generation cephalosporins and other Watch-group agents. Although these antibiotics have important clinical indications, unnecessary exposure may increase selective pressure for antimicrobial resistance.[19,20]

The principle of antimicrobial stewardship is to use the narrowest effective spectrum for the shortest appropriate duration, while ensuring adequate treatment of the underlying infection.[21,24] Therefore, the frequent use of broad-spectrum antibiotics observed in this study emphasizes the need for regular prescription review and antimicrobial de-escalation when microbiological and clinical information permits.

The use of meropenem and colistin was relatively limited. This pattern is desirable from a stewardship perspective because these agents should be reserved for selected infections where alternative effective antibiotics are unavailable or inappropriate. Their use should ideally be supported by clinical indication and, whenever possible, microbiological and antimicrobial susceptibility data.[24,25]

WHO AWaRe classification: The WHO AWaRe classification was an important component of the present study. The findings demonstrated a predominance of Watch-group antibiotics, including ceftriaxone, cefotaxime, and fluoroquinolones. Watch antibiotics generally have greater potential to contribute to antimicrobial resistance and therefore require careful monitoring and stewardship interventions.[24,25]

In contrast, Access antibiotics are generally preferred as first- or second-choice agents for many common bacterial infections because of their comparatively lower resistance potential. The relatively lower use of Access antibiotics in the present study therefore suggests an opportunity to strengthen adherence to evidence-based prescribing recommendations whenever these agents are clinically appropriate.[24,25]

The WHO has previously promoted a target of at least 60% of total antibiotic consumption from the Access group as an important stewardship indicator. More recently, global efforts have moved toward a more ambitious target of at least 70% Access-group consumption by 2030.[24] Therefore, the AWaRe distribution observed in the present study should be interpreted according to the WHO target applicable to the period and classification framework used in the study.

An important correction to the earlier discussion is that ciprofloxacin and ofloxacin should not be described as Access antibiotics. Fluoroquinolones such as ciprofloxacin and ofloxacin are classified within the Watch group under the WHO AWaRe framework.[24,25] Therefore, the statement regarding "underutilisation of Access antibiotics such as Amoxicillin and Ciprofloxacin" should be removed or revised.

Gender-wise antibiotic utilization: A difference in the number of antibiotics prescribed according to gender was also observed, with a higher proportion of male patients receiving multiple antibiotics than female patients. However, this observation should be interpreted cautiously because differences in antibiotic utilization may be influenced by underlying disease severity, type of clinical condition, surgical procedures, duration of hospitalization, and other patient-related factors.

The present study did not independently assess these factors; therefore, the observed gender difference cannot be considered evidence of gender-based prescribing bias. Further studies with multivariable analysis would be useful to determine whether gender independently influences antibiotic utilization.

Implications for antimicrobial stewardship: The findings of the present study highlight the need to strengthen antimicrobial stewardship activities within the study hospital. Important interventions

include the development and implementation of institutional antibiotic guidelines, regular prescription audits, prospective audit and feedback, antimicrobial restriction policies where appropriate, and increased utilization of microbiological investigations to guide therapy.[21,24]

Particular emphasis should be placed on de-escalation of empirical therapy once microbiological results and clinical response become available. Antibiotic selection should consider the suspected site of infection, disease severity, patient-specific risk factors, local antimicrobial susceptibility patterns, and the narrowest effective antimicrobial spectrum.[21,24]

The AWaRe classification can provide a practical framework for monitoring antibiotic consumption and identifying departments or clinical conditions with high utilization of Watch and Reserve antibiotics. Regular monitoring of AWaRe distribution may therefore serve as an important component of institutional antimicrobial stewardship.[24,25]

Clinical and public-health significance: The high utilization of ceftriaxone and other Watch-group antibiotics, together with substantial prophylactic use and multiple-antibiotic prescribing, identifies several areas where antimicrobial stewardship interventions may be beneficial. However, prescribing frequency alone does not establish inappropriate antibiotic use or directly demonstrate antimicrobial resistance.

Therefore, the present findings should be interpreted as identifying potential areas for intervention rather than proving that all observed prescriptions were irrational. Detailed prescription audits incorporating clinical indication, antibiotic choice, dose, route, duration, microbiological findings, and clinical outcome would provide a more accurate assessment of prescribing appropriateness.[21,24]

Future research: Future studies should incorporate microbiological culture results, antimicrobial susceptibility patterns, antibiotic dose and duration, clinical outcomes, length of hospital stay, adverse drug reactions, and patient-level risk factors. Such information would allow a more comprehensive evaluation of antibiotic prescribing quality and its relationship with antimicrobial resistance.

Longitudinal surveillance would also help determine whether implementation of antimicrobial stewardship interventions results in increased Access-group utilization and reduced unnecessary use of Watch and Reserve antibiotics.[24,25] Multicentre studies involving hospitals from different regions of India would further improve the generalizability of findings.

Overall interpretation: Overall, the present study demonstrates that antibiotic prescribing in the study hospital was characterized by substantial use of broad-spectrum Watch-group antibiotics, with ceftriaxone being the most frequently prescribed agent. The findings emphasize the importance of strengthening antimicrobial stewardship through rational antibiotic selection, appropriate surgical prophylaxis, reduction of unnecessary combination therapy, microbiology-guided treatment, de-escalation of empirical therapy, and regular monitoring of AWaRe distribution.

The study therefore provides a useful baseline for evaluating antibiotic utilization and for developing institution-specific antimicrobial stewardship interventions aimed at promoting rational antibiotic use and reducing the potential selection pressure associated with inappropriate antimicrobial exposure.

CONCLUSION

The present prospective observational study provides important insights into antibiotic prescribing practices in a tertiary care centre in South Gujarat. Ceftriaxone was the most frequently prescribed antibiotic, indicating substantial utilization of broad-spectrum antimicrobial agents across different clinical departments and indications. Prophylactic antibiotic use accounted for 41% of prescriptions, with higher utilization observed in surgical and selected clinical settings.

Monotherapy was more frequently observed in Medicine and Paediatrics, whereas multiple-antibiotic prescribing was more common in surgical specialties. The findings demonstrate considerable variation in antibiotic utilization according to department and clinical indication, highlighting the need for regular evaluation of prescribing practices.

The WHO AWaRe analysis showed a predominance of Watch-group antibiotics, while Access-group antibiotics were comparatively less frequently utilized and Reserve antibiotics were used to a limited extent. This pattern indicates an opportunity to improve alignment with WHO-recommended principles of antibiotic stewardship. However, antibiotic utilization frequency alone cannot establish whether an individual prescription was inappropriate; prescription-level assessment against clinical and institutional guidelines is required.

The findings emphasize the need to strengthen antimicrobial stewardship programmes through evidence-based antibiotic selection, diagnosis- and microbiology-guided therapy, appropriate surgical prophylaxis, avoidance of unnecessary combination therapy, timely de-escalation of empirical treatment, and regular prescription audits with feedback. Monitoring antibiotic consumption using the WHO AWaRe framework may further assist in identifying areas requiring intervention.

Overall, optimising antibiotic prescribing practices is essential to reduce unnecessary antimicrobial exposure and the potential selection pressure for antimicrobial resistance, while maintaining effective treatment of bacterial infections. The present study provides a useful baseline for developing institution-specific antimicrobial stewardship strategies and for future studies evaluating their impact on antibiotic utilization and clinical outcomes.

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