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**A CROSS-SECTIONAL STUDY ON ANTIBIOTIC PRESCRIBING  
PATTERN ACCORDING TO THE WHO AWARE CLASSIFICATION AT  
A SUPER SPECIALTY HOSPITAL IN SOUTH INDIA**

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**ABSTRACT**

Research on antibiotic prescription practices in India is crucial due to resistance, limited data, knowledge gaps, and the importance of evidence-based interventions for public health. The current study was performed to evaluate the antibiotic prescribing pattern and its use in out-patient department of a super specialty hospital in south India. The six-month study approved by the ethics committee included patient prescription of different ages and genders diagnosed with infections and prescribed antibiotics. Patient information, including health status, antibiotic details, and prescription trends, was collected with consent. Antibiotic prescribing pattern and its use was investigated with the help of World Health Organization access, watch, reserve antibiotics and core prescribing indicators. In 285 prescriptions a total of 747 drugs were identified, averaging 2.62 drugs per encounter. Among which 4.15% were generic, 83.5% were essential medicines, and 9.47% were injections. Antibiotics were used in 42.23% of encounters, averaging 1.08% per prescription. Overutilization of antibiotics was observed in the Watch category (41.6%), while 6.8% were categorized as Reserve. The most commonly prescribed antibiotics consisted of a combination of penicillins and beta lactamase inhibitors (29.1%). The study revealed a discrepancy in antibiotic prescribing practices, characterized by under-prescribing

in the access category and over-prescribing in the watch category. Interventions and regular reviews are needed to combat the negative impacts of inappropriate antibiotic use.

**Keywords: WHO, antibiotics, access, watch, reserve, prescribing pattern, utilization**

## INTRODUCTION

Antimicrobial resistance is a major threat to public health [1, 2], causing serious illnesses, higher healthcare costs, and ineffective treatments [3-5]. The problem is worsened by irrational prescriptions both domestically [6-9] and globally [10-14]. India is a leading consumer of antibiotics [15], with poor prescription practices [16] contributing to high resistance levels [17]. The country's Drug Resistance Index in 2019 [18] highlights the need for regional surveillance and stewardship programs in healthcare settings [19, 20]. The antibiotic stewardship program are crucial in promoting appropriate antibiotic use, improving patient outcomes, and preventing infections [21]. The World Health Organization (WHO) Access, Watch, and Reserve (AWaRe) 2021 Classification [22] and the Strengthening Pharmaceutical Systems (SPS) [23] program provide support for surveillance and stewardship efforts. Urgent research is needed to address antibiotic prescription practices in India and fill data gaps to protect public health [24]. The current study in out-patient department of a super specialty hospital in south India was conducted to investigate the antibiotic prescribing pattern by WHO AWaRe 2021

Classification and its use as per the WHO core prescribing indicators.

## MATERIAL AND METHOD

The six months descriptive cross-sectional study, approved by the ethics committee (RIPER/IRB/2023/0060) was performed in the outpatient department dispensing pharmacy of a super specialty hospital in south India. Prescriptions of patients of both genders of all ages, diagnosed with infections, and started on at least one antibiotic agent were included; and prescriptions with incomplete data were excluded. Sampling was convenient and purposive. Patients' personal details, baseline conditions, laboratory investigations; antibiotic agent name, dose, dosage, therapy days, route and rate of administration, prescribed as generic or brand, and fixed-dose combination (FDCs), and its availability in hospital pharmacy were obtained and recorded in the data collection form, after obtaining a proper concern from the patients. The antibiotic prescribing pattern and its use were investigated by using WHO AWaRe 2021 Classification and WHO core prescribing indicators. Descriptive statistical analysis was carried out using MS Excel and GraphPad Prism. Absolute numbers and

frequencies (%) were calculated for qualitative variables, while arithmetic means and standard deviations (SD) were calculated for quantitative variables respectively.

## RESULTS

The current investigation uncovers fresh findings regarding the rates of outpatient antibiotic prescriptions, as well as the utilization patterns of AWaRe antibiotics, within a super specialty hospital in south India. During the 6 months study period, we evaluated 285 prescriptions collected purposively comprising of one or more antibiotics. There was a total of 60% (171) male and 40% (114) female. Patients in the 41-60 years of age group were prescribed with a high number of antibiotics. **Table 1** summarises the characteristics of the demography.

In 285 prescriptions, a total of 747 drugs were identified, with an average of 2.62 drugs per encounter. Percentage of drugs

prescribed as generic (4.15%), as per essential medicine list (EML) (83.5%), and as injections (9.47%) respectively. The encounters prescribed with antibiotics and the mean antibiotic in each prescription are 308 (42.23) and 1.08% respectively; responses are thoroughly analyzed in accordance to WHO optimal values [25] and reported in **Table 2**.

In our study, 128 out of the 308 prescribed antibiotics, accounting for 41.56%, belong to the Watch category of the WHO AWaRe 2021 classification. On the other hand, 40 antibiotics, equivalent to 12.99%, do not fall under this classification, observation of which are presented in **Table 3**.

Our study found that, combination of penicillins and beta lactamase inhibitors were the most commonly prescribed antibiotics making up 29.1% (78) of cases, observation of which are summarized in **Table 4**.

**Table 1: Demography characteristics of study participants**

Age group (in years)	Male (n, %)	Female (n, %)	Total (n, %)
<20	29 (10.1%)	13 (4.6%)	42 (14.7%)
21-40	47 (16.4%)	47 (16.4%)	94 (32.9%)
41-60	66 (23.1%)	37 (12.9%)	103 (36.1%)
61-80	27 (9.5%)	16 (5.6%)	43 (15.1%)
>80	2 (0.7%)	1 (0.3%)	3 (1.0%)
Total	171 (60%)	114 (40%)	285

**Table 2: Pattern of drug use**

Prescribing Indicators	Value	WHO optimal values
Average number of medicines per encounter?	2.62	<2
Percentage of prescriptions with generic name?	4.15%	100%
Percentage of encounters with drugs prescribed from EML (NLEM)?	83.58%	100%
Number of encounters with an injection prescribed?	9.47%	13.4%-24.1%
Percentage of encounters with one or more antibiotics? *	100%	20%-26.8%

Table 3: Classification of the antibiotics as per the WHO AWaRe 2021

AWaRe Classification			Other antibiotics (Unclassified + NR)
Access (%)	Watch (%)	Reserve (%)	
119 (38.6%)	128 (41.6%)	21 (6.8%)	19 (6.1%) + 21 (6.8%)

Table 4: Categorization of antibiotic class prescribed as per WHO AWaRe 2021

Antimicrobial class	N (%)	WHO AWaRe group
First generation Cephalosporins	01 (0.3%)	Access
Second generation Cephalosporins	09 (3.3%)	Watch
Third generation Cephalosporins	51 (19%)	Watch
Aminoglycosides	03 (1.1%)	Access
Combination of penicillin, including beta lactamase inhibitors	78 (29.1%)	Access/NR
Carbapenems	05 (1.8%)	Watch
Fluoroquinolones	31 (11.5%)	Watch
Imidazole	22 (8.2%)	Access
Macrolides	26 (9.7%)	Watch
Nitrofurantoin derivatives	12 (4.4%)	Access
Penems	14 (5.2%)	Reserve
Tetracyclines	07 (2.6%)	Access
Oxazolidinones	09 (3.3%)	Reserve
(* Other antimicrobials: Unclassified + NR = 19 (6.1%) + 21 (6.8%))		

## DISCUSSION

Prescription auditing is crucial in hospitals to ensure proper medication use. WHO core indicators evaluate healthcare professionals' performance in key areas of medication use [26]. This study aims to categorize antibiotic usage using the WHO AWaRe 2021 classification and assess prescription accuracy based on the WHO Prescribing indicators.

In our study, we found that the average number of medications per encounter was 2.62%, higher than the WHO recommended range of 1.6–1.8% [25]. These results align with Hazra *et al.*, [27] (3.2%) but are lower than Wang *et al.*, [28] (3.52%) and Bimo *et al.*, [29] (3.8%). Our study also showed higher medication usage compared to previous Indian studies by Rehan *et al.*, [30] (2.4%) and Tripathy *et al.*, [31] (2.9%) as well as studies from Sudan [32] (1.4%) and Zimbabwe [29] (1.3) respectively. Only

4.15% of medications in our research were prescribed using generic names, below the WHO guideline of 100% [25]. This percentage was lower than figures in previous studies by Tripathy *et al.*, [31] (68%) and Hazra *et al.*, [27] (46.2%), but higher than Chandelkar and Rataboli [33] (0.05%) and similar to Rehan *et al.*, [30] (1.5%).

In our research, the proportion of injection encounters was 9.47 percent, clearly falling below the recommended range set by the World Health Organization (13.4-24.1%) [25]. It was significantly lower when compared to other areas like South Ethiopia (38.1%) [34] and Uganda (48%) [32], but similar to the results reported by Tripathy *et al.* (8%) [31].

Our research found that 83.58% of National List of Essential Medicines (NLEM) medications were used, below the optimal 100% and higher than the 45.71% reported

by Hazra *et al.*, [27] in India. Prescription rates from the essential medicine list in India are lower than in South Ethiopia [34].

In the current study on antibiotic prescribing trends based on the WHO AWaRe 2021 classification; we found that only 38.6% of antibiotics belonged to the Access group, which is below the recommended benchmark [35]. Overutilization of antibiotics was observed in the Watch category (41.6%), while 6.8% were categorized as Reserve and 12.9% were not classified under any AWaRe category. These trends indicate a deviation from the WHO's target of 60% procurement from the access group [36], similar to the findings of Gulwani *et al.*, [37] (46.36%) and Mugada *et al.*, [38] (53.19%). In this research, the most commonly prescribed antibiotics consisted of a combination of penicillins and beta lactamase inhibitors (29.1%). Following closely were third-generation cephalosporins (19%), fluoroquinolones (11.5%), and macrolides (9.7%); findings of which are similar to outpatient antibiotic use observed in other Indian studies [39-41].

Considering the rise in antimicrobial resistance to fluoroquinolones [42] and the growing utilization of third generation cephalosporins categorized under Watch group, it is worth exploring and documenting results with traditional first-line antibiotics (such as amoxicillin, sulfamethoxazole/trimethoprim, and

chloramphenicol) falling under Access group for mild to moderately severe cases of enteric fever, particularly in facilities equipped with microbiological and antimicrobial susceptibility testing capabilities.

## CONCLUSION

The study concluded that there was a notable deviation from WHO standards in antibiotic prescriptions. The utilization of antibiotics from the Access-group was below WHO recommendations, while the consumption of antibiotics from the Watch-group was high. It is crucial to implement intervention strategies and conduct regular prescription audits to avoid the negative effects of inappropriate antibiotic use.

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