

Assessment of Antibiotic Prescribing Pattern as per AWaRe Assessment Tool of Antimicrobial Stewardship Program

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Abstract:

Introduction: The development of antimicrobial resistance is a matter of great public health concern. Antimicrobial resistance attributes 700,000 deaths per year which may increase to 10 million by the year 2050 if current trends continue. The estimated cumulative loss of economic output from antimicrobial resistance by 2050 would amount to 20 to 35 trillion US dollars. The Antimicrobial Stewardship Program (AMSP) has shown obvious benefits in reducing the rate of improper use of antibiotics. There is enough evidence to prove that AMSP is useful to promote rational antibiotic use and reduce the cost of therapy.

Objectives: To monitor stewardship policies that optimize antibiotic use and curb antimicrobial resistance in various departments of Pt. JNM Medical College Raipur (C.G).

Material and Method: A cross-sectional study was conducted at Pt JNM Medical College Raipur Chhattisgarh. Data collection was done from 08/07/2023 to 08/10/2023. This study was conducted by reviewing the prescriptions of outpatients of various departments. A total of 1013 prescriptions were collected from different departments. Antibiotics were Categorised into AWaRe groups and compared with Standardised WHO AMSP guidelines.

Result: Out of 1013 patients in the study, 49 % (501) were males and 51% (512) were females. The “Access” group of antibiotics were prescribed in 48 % (484), the “Watch” group in 49 % (502), and the “Reserve” Group in 3 % (28). Among the Access group, Metronidazole was the most frequently prescribed antibiotic followed by amoxicillin, amoxicillin /clavulanic acid, and doxycycline while in the “Watch” Group azithromycin was the most commonly prescribed antibiotic followed by Ceftriaxone and cefixime. Linezolid was the most prescribed among the Reserve group.

Conclusion: This study found considerable variation from AWaRe prescribing guidelines in the Access group & high prescription of Watch group Antibiotics. Azithromycin and ceftriaxone were the most prescribed antibiotics. This result is of great concern and emphasizes strengthening the antimicrobial stewardship programme at Pt JNM Medical College Raipur.

Keywords: Antimicrobial Resistance, AWaRe Classification, Antimicrobial Stewardship Program.

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Introduction

Antimicrobial resistance (AMR) is a critical public health issue, threatening the effectiveness of antibiotics essential for treating bacterial infections. AMR arises from several factors, notably the overuse and misuse of antibiotics, which accelerates the evolution of resistant pathogens. Consequently, previously manageable infections become increasingly difficult to treat, resulting in prolonged illness, higher healthcare costs, and increased mortality. AMR is currently responsible for approximately 700,000 deaths annually, a figure projected to escalate to 10 million deaths per year by 2050 if effective interventions are not implemented [1]. Economically, AMR could have a

devastating impact, with the World Bank estimating cumulative global economic losses between 20 and 35 trillion US dollars by mid-century, which would strain healthcare systems and hinder economic growth [2].

To mitigate AMR, Antimicrobial Stewardship Programs (ASPs) have been established worldwide. These programs aim to promote the judicious use of antibiotics in healthcare settings, ensuring appropriate prescribing practices, reducing misuse, and thereby improving patient outcomes [3-5].

ASPs often utilize structured tools and strategies, among which the AWaRe (Access, Watch,

Reserve) classification system, developed by the World Health Organization (WHO), is particularly impactful. The AWaRe framework categorizes antibiotics into three groups based on their role in resistance and appropriate usage contexts: Access antibiotics, which are recommended as first-line treatments for common infections; Watch antibiotics, more potent agents used judiciously to prevent resistance; and Reserve antibiotics, considered last-resort options for severe cases when other alternatives have failed [6].

Incorporating the AWaRe classification within ASPs enhances the ability of healthcare providers to make informed antibiotic selections, minimizing unnecessary exposure to potent antibiotics and curbing resistance development. Research shows that AWaRe improves consistency in antibiotic use across diverse healthcare settings, fosters better prescribing practices, and enables more effective tracking of antibiotic consumption patterns to detect misuse [7-8].

Additionally, the system has a broader public health impact, as it supports advocacy efforts and raises awareness about AMR and responsible antibiotic use among both healthcare professionals and the public [9]. Ultimately, the AWaRe system plays an essential role in ASPs, contributing to global efforts to control AMR. Its structured guidance helps healthcare providers optimize antibiotic use, thus reducing the spread of resistance, enhancing patient safety, and safeguarding the effectiveness of antibiotics for future generations [10,11].

Through such strategic tools and stewardship initiatives, healthcare systems can better address the AMR crisis, protecting public health and supporting sustainable healthcare outcomes [12].

Objectives: Monitor stewardship policies that optimize antibiotic use and curb antimicrobial resistance in various departments of Pt. JNM Medical College Raipur (C.G).

Material and Methods

Study Design: Cross-sectional study.

Study Setting: Pt. J.N.M. Medical College associated Dr. B.R.A.M. Hospital Raipur, Chhattisgarh.

Study Sample: Patients visiting different OPDs at Dr. B.R.A.M. Hospital Raipur, Chhattisgarh from July 2023 to September 2023. A total of 1013 prescriptions were collected.

Methodology: A cross-sectional study was conducted in the Department of Pharmacology Pt.

JNM Medical College & associated Dr. B.R.A.M. Hospital Raipur, Chhattisgarh, India after getting approval from the Institutional Ethics Committee (IEC). A Google form was formulated according to the WHO Antibiotic AWaRe classification. Digital pictures of 1013 OPD prescriptions of various departments of Dr. B.R.A.M. Hospital Raipur were taken from 8/ 7/ 2023 to 8 /10/2023. Prescriptions were used to fill the formulated Google form. Data was analyzed and subjected to statistical analysis by using MS Excel version 2021.

Statistical Analysis: The data was analyzed on the MS EXCEL version 2021 for Windows.

Result

A detailed antibiotic prescribing practice was carried out at Pt. J.N.M. Medical College Raipur, involving 1,013 patients. The study found that 49 % of the patients were male (501), while 51% were female (512). The analysis assessed adherence to WHO-recommended antibiotic guidelines and revealed significant patterns in prescribing. Antibiotics from the "Access" group were prescribed in 48 % (484) of cases, "Watch" group antibiotics in 49 % (501), and "Reserve" group antibiotics in 3 % (28). This distribution highlights a marked predominance of the "Watch" category, exceeding the WHO's recommended limit.

Departmental Insights

Medicine: Metronidazole (12.23%) was the most frequently prescribed "Access" antibiotic, followed by amoxicillin, amoxicillin/clavulanic acid, and doxycycline. In the "Watch" group, azithromycin (13.7%) was the most common, with ceftriaxone and cefixime also frequently used. Linezolid was the primary antibiotic in the "Reserve" group.

ENT: Amoxicillin/clavulanic acid (55%) was the predominant choice, with ciprofloxacin (11%) also commonly prescribed.

Ophthalmology: Moxifloxacin (55%) led the prescriptions.

Obstetrics & Gynecology: Metronidazole (45.3%) was the most frequently used "Access" antibiotic, while cefixime (26.4%) was most common in the "Watch" group.

Pediatrics: Amoxicillin (39%) and amoxicillin/clavulanic acid (15%) were widely prescribed, with ciprofloxacin (15%) noted in the "Watch" group.

Dermatology: Doxycycline (39%) and clindamycin (31%) were the most frequently prescribed antibiotics.

Table 1: Distribution of Access, Watch and Reserve group antibiotics among Study Population

Department	Access	Watch	Reserve
Medicine (478)	Amoxycillin (56) Amoxiclav (24) Metronidazole (58) Nitrofurantoin (8) Doxycycline (21) Ampicillin (13)	Azithromycin (65) Cefixime (44) Ceftriaxone (45) Clarithromycin (14) Ofloxacin (31) Cefpodoxime (10) Rifaximin (8) Norfloxacin (14) Erythromycin (10) Moxifloxacin (12) Ciprofloxacin (27)	Linezolid (11) Feropenam(10)
ENT (80)	Amoxiclav (44) Amoxycillin (22) Chloramphenicol (1)	Ciprofloxacin (9) Ceftriaxone (2) Cefotaxime (2)	
Ophthalmology (69)		Moxifloxacin (38) Gatifloxacin(6) Norfloxacin (6) Ciprofloxacin (10) Azithromycin (9)	
Obstetrics & Gynecology (106)	Metronidazole (48) Ampicillin (08) Nitrofurantoin (5)	Cefixime (28) Ceftriaxone (20)	Linezolid (7)
Pediatrics (46)	Amoxycillin+ Clavulanic acid (07) Amoxycillin (18) Metronidazole (4)	Ciprofloxacin (07) Ceftriaxone (5) Azithromycin (5)	
Surgery (18)	Amoxiclav (04)	Cefixime (08) Ceftriaxone (06)	
Dermatology (141)	Doxycycline (55) Clindamycin (44)	Azithromycin (25) Clotrimazole (17)	
Respiratory Medicine (41)	Amoxycillin (11) Amoxycillin+ Clavulanic acid (07) Metronidazole (4) Ampicillin (07) Doxycycline (08)	Ceftriaxone (4)	
Orthopedic (34)		Ceftriaxone (15) Ciprofloxacin (13) Moxifloxacin (6)	

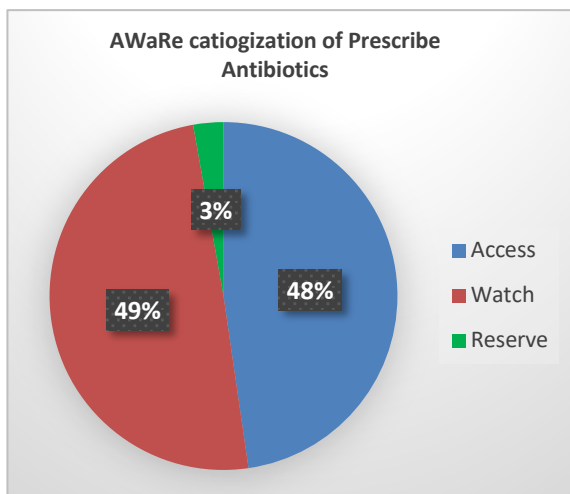


Figure 1: AWARe catiogization of Prescribe Antibiotics

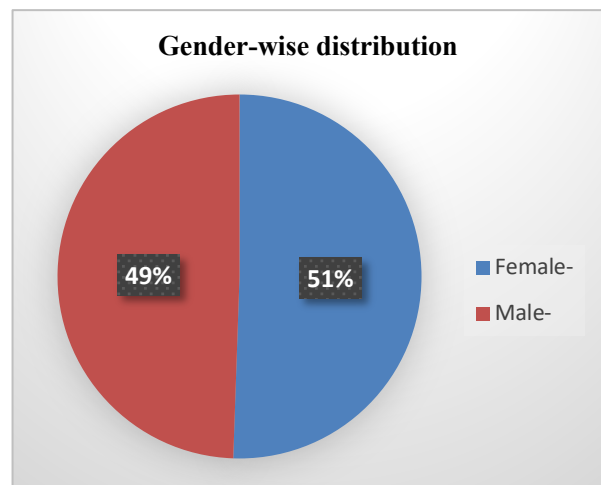


Figure 2: Gender-wise distribution

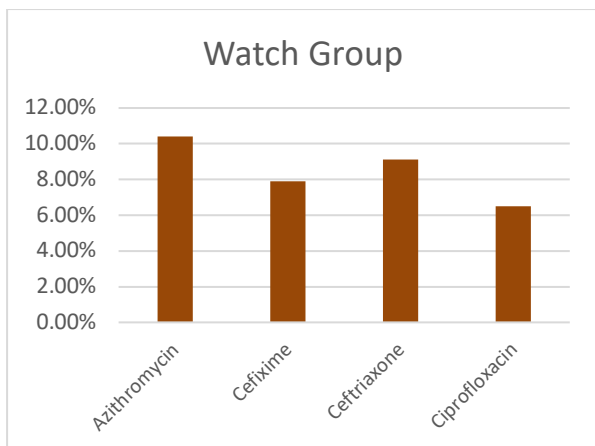


Figure 3: Watch group

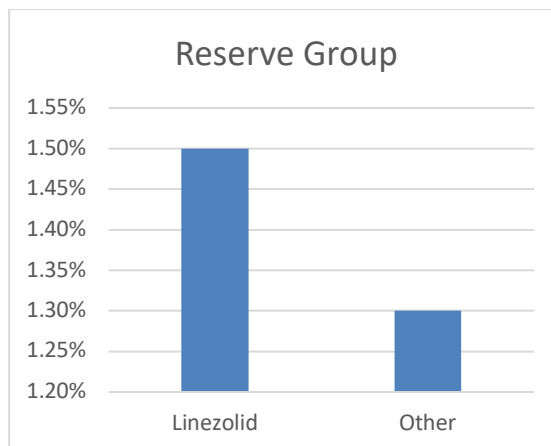


Figure 4: Reserve Group

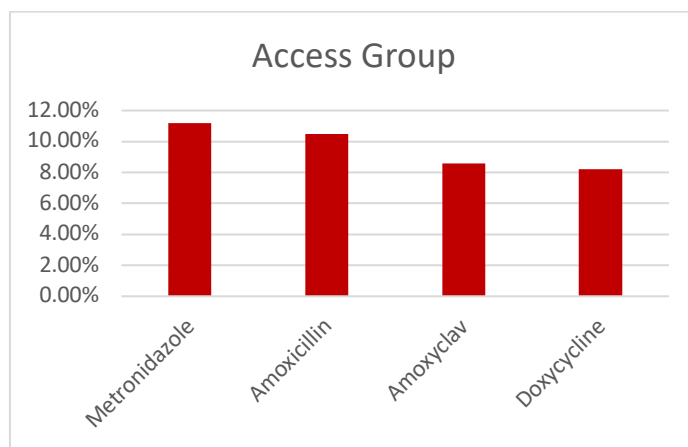


Figure 5: Access group

Discussion

Antimicrobial stewardship is crucial in combating the growing threat of antimicrobial resistance (AMR). Analysing antibiotic prescribing patterns provides valuable insights into the effectiveness of stewardship practices and highlights areas requiring intervention. Recent findings from Pt. J.N.M. Medical College Raipur reveals significant deviations from WHO-recommended guidelines, signalling the need for enhanced stewardship strategies. This article examines these patterns and compares them with global data to underscore the implications of improving antibiotic use.

Underutilization of Access Group Antibiotics:

The study at Pt. J.N.M. Medical College Raipur revealed that only 48 % of prescribed antibiotics were from the "Access" group, falling short of the WHO’s recommended threshold of 60%. This trend of underutilization is consistent with findings from other Indian studies. Patel et al. (2020) and Sharma et al. (2022) observed similarly low adherence to the "Access" category [13-14].

In contrast, high-income countries such as Australia and the United Kingdom report higher utilization rates of "Access" antibiotics. Smith et al. (2020) documented that adherence to this category

often exceeds 60% in these regions, owing to more stringent stewardship practices [15]. The lower utilization of "Access" antibiotics in India suggests a potential gap in prescribing practices that could contribute to rising AMR. Insufficient use of these safer, lower-resistance antibiotics may result in increased reliance on "Watch" antibiotics, which are associated with a higher risk of resistance.

Overuse of Watch Group Antibiotics:

The analysis also revealed that "Watch" antibiotics constituted 49 % of prescriptions, exceeding the WHO’s recommended maximum of 40%. This overuse mirrors concerns from other Indian studies, such as Gupta et al. (2021), which reported similar patterns [16]. The frequent use of "Watch" antibiotics, including azithromycin and ceftriaxone, raises significant AMR concerns due to their higher potential for resistance development. Conversely, countries with well-established Antimicrobial Stewardship Programs (ASPs), such as Sweden, report lower utilization of "Watch" antibiotics. Lundborg et al. (2021) found that "Watch" antibiotics made up less than 30% of total prescriptions in Sweden, reflecting effective stewardship and adherence to guidelines [17]. The discrepancy between India’s higher rates and the lower rates observed in other countries underscores

the need for robust stewardship strategies to mitigate overprescription and reduce resistance risk.

Controlled Use of Reserve Group Antibiotics: Our study found that "Reserve" antibiotics were prescribed in 3 % of cases, aligning well with WHO recommendations. This restrained use is consistent with practices observed in high-income countries. Patel et al. (2020) reported that "Reserve" antibiotics constituted only 3% of prescriptions in the United States [18]. However, this contrasts with some low- and middle-income countries (LMICs) where "Reserve" antibiotics are more frequently prescribed due to weaker regulatory oversight. For example, Eze et al. (2021) reported a higher usage rate of 7% in Nigeria [19]. The controlled use of "Reserve" antibiotics in our study reflects effective adherence to guidelines, indicating that this aspect of stewardship is managed appropriately.

Global Insights and Implications for Antimicrobial Stewardship: The comparison of these findings with global data reveals notable gaps in antibiotic stewardship in India. While the controlled use of "Reserve" antibiotics is commendable, the underutilization of "Access" antibiotics and over-reliance on "Watch" antibiotics highlight areas needing improvement. Countries with well-established ASPs, such as Norway and Canada, demonstrate that targeted interventions, including prescriber education, regular audits, and stringent regulations, can lead to more balanced antibiotic use [20-21]. The disparity between India's prescribing patterns and those observed in other regions suggests that India must focus on capacity building, regulatory enforcement, and public health education to align with global best practices [22-23]. Strengthening these areas is essential to address the current deficiencies and achieve sustainable improvements in antibiotic use. By implementing comprehensive stewardship strategies, India can effectively combat AMR and enhance patient outcomes, contributing to global health efforts in managing antibiotic resistance.

Limitations of the Study: This study provides valuable insights into antibiotic prescribing practices but has a few limitations to consider. The cross-sectional design offers a snapshot of prescribing patterns at a specific point in time, which may not capture changes over time or long-term trends. The reliance on prescription data, while useful, does not account for the clinical context or rationale behind prescribing decisions, potentially limiting the understanding of why certain antibiotics are chosen. Additionally, the study's focus on a single institution provides detailed insights into practices at Pt. J.N.M. Medical College Raipur may not fully represent broader trends across different regions or

healthcare settings. Despite these limitations, the study's findings are significant and offer a strong foundation for future research and improvements in antimicrobial stewardship. The results highlight key areas for further studies and provide a basis for developing targeted interventions to enhance antibiotic use.

Conclusion

The findings from Pt. J.N.M. Medical College Raipur emphasize the need for enhanced Antimicrobial Stewardship Programs in India. While the controlled use of "Reserve" antibiotics aligns with global best practices, the underutilization of "Access" antibiotics and the high prescription rates of "Watch" antibiotics are areas of concern. Strengthening AMSP efforts through targeted education, stricter guidelines, and regular monitoring is crucial for aligning local practices with global standards and effectively combating AMR.

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