

Editorial



OPEN ACCESS

Rational Prescription of Antibiotics: Where Do We stand?

Zafar Ali*

Department of Medicine, Lady Reading Hospital, Peshawar-Pakistan

Article Info

Corresponding Author

Dr. Zafar Ali

Department of Medicine, Lady Reading Hospital, Peshawar-Pakistan.

Email: sameedajuly@gmail.com

Antibiotics are a group of medicines used to treat bacterial infections by either killing the bacterial organism (bactericidal) or halting its growth (bacteriostatic). Antibiotics are further sub-classified into different categories based on differences in pharmacokinetics, pharmacodynamics, adverse effect profiles, spectrum of activity, time vs. concentration dependent killing and effectiveness in clinical settings.¹ A clear understanding and crisp knowledge regarding use of antibiotics is therefore of paramount importance for rational prescription of antibiotics.

Injudicious use of antibiotics in the form of over prescription of antibiotics or wrong combinations of antibiotics (either of similar spectrum e.g. piperacillin + co-amoxiclav, cefoperazone-sulbactam + ciprofloxacin; or having potential adverse effects like levofloxacin+ azithromycin) leads to antimicrobial resistance, rendering antibiotics ineffective. Antibiotic resistance is considered a major worldwide threat to health irrespective of patients' age, gender and geo-ethnic background.² Antibiotic resistance is a multi-factorial phenomenon acquired over time by bacteria but the process is accelerated by injudicious use of antibiotics in human beings as well as in animals and live stocks. In a resource-limited country like Pakistan, it carries a huge burden. The consequences of antibiotic resistance include increase in health-related costs (due to higher length of hospital stays, prolonged and expensive antibiotics use) and poor infection control. Moreover, it is associated with increased mortality which is predicted to be around 10 million deaths globally by year 2050.³

The prevailing illnesses like tuberculosis, enteric fever and urinary tract infections (UTI) are increasingly being reported as multi-drug (MDR) or extensive-drug resistant (XDR) strains. In the worst case scenario, pan-resistant bugs are reported which are extremely difficult to treat. To further complicate the matters, no new antibiotics are approved and added in last several years.

For optimal use of antibiotics, it's essential to consider the anti-microbial spectrum/ coverage, drug penetration into target / privileged sites, expected or isolated pathogen, prevalence of known resistance and clinical indication or syndrome. Host factors/co-morbidities are extremely important while deciding about initiation of antibiotics (careful vs. aggressive antibiotics therapy). These include patients with diabetes, HIV, pregnancy, cancer (on chemo), and elderly or hospitalized patients. Challenges and barriers⁴ which hinders the rational prescription of antibiotics include inadequate culture specimens, organism susceptibility, lack of hospital antibiogram, resources availability, medications affordability & availability, lack of professional competence, and social factors. These need to be addressed and managed locally as well as at national level. In this regard, antibiotic stewardship, availability of hospital antibiogram and the use of antibiotic ladder cannot be over-emphasized. Antibiotic stewardship is defined as "using right drug for right bug (indication), with right dose, via right route and for the right duration" to preserve effectiveness of antibiotics.⁵

**This article may be cited as:**

Ali Z. Rational prescription of antibiotics: Where do we stand? J Postgrad Med Inst. 2025;39(1):1-2. <http://doi.org/10.54079/jpmi.39.1.3674>

Antibiotic ladder describes the stepwise and logical approach in choosing the most appropriate antibiotic based on antibiotics spectrum (from broad to narrow) and severity of infection. In simple terms, a canon should not be used to kill a sparrow. It is also used for escalation/de-escalation of antibiotics accordingly. According to CDC, >50% of prescribed antibiotics in hospitalized patients were not in line with recommended guidelines (irrational in 79% cases of community acquired pneumonia and 77% of UTIs).⁶

Hospital antibiogram⁷ based on prevailing organisms and C/S Patterns need to be developed by microbiologist, infectious disease specialist and physician (internist); and should be made available in all units of the hospital for ready reference. This will help in selection of proper antibiotic and will save time using non-effective drugs e.g. patients with UTI will be treated with cefoperazone-sulbactam or piperacillin but not with ceftriaxone or quinolones to whom high resistance is reported. Similarly, XDR Enteric Fever will be treated with meropenem or azithromycin but not with ceftriaxone or quinolones.

Gaps in clinical practice regarding rational prescription of antibiotics should be addressed as follows:

1. Antibiotics use should be strictly regulated. Quackery and un-qualified prescriptions should be discouraged.⁸
2. Antibiotics should be used judiciously. All essential factors (mentioned above) need to be considered while choosing and prescribing an antibiotic.⁹
3. Appropriate cultures should be done at the first interaction before giving empiric antibiotics. Always opt for C/S based therapy.
4. Antibiotic stewardship¹⁰ is the need of the day to reduce the development of antibiotic resistance.
5. Hospital antibiogram need to be developed and made available in all the units of the institute (hospital) for ready reference.
6. Availability of important antibiotics in hospital pharmacy is crucial so that appropriate antibiotics are used every time for the relevant indications.
7. Best clinical practice guidelines should be followed at hospital /health care facility level.

8. Microbiologist, hospital pharmacist and infectious disease specialist need to be hired on priority basis to boost the quality of care.
9. Workshops on antibiotics selection and use should be arranged for better awareness and to highlight this important and burning issue.

References

1. Nemeth J, Oesch G, Kuster SP. Bacteriostatic versus bactericidal antibiotics for patients with serious bacterial infections: systematic review and meta-analysis. *J Antimicrob Chemother* 2015;70:382-95.
2. Dadgostar P. Antimicrobial resistance: implications and costs. *Infect Drug Resistance* 2019;12:3903.
3. Chirico F. The key role of government national planning around the world for antimicrobial resistance: state of the art and perspectives. *J Health Soc Sci* 2018;3:9-12.
4. Sami R, Salehi K, Sadegh R, Solgi H, Atashi V. Barriers to rational antibiotic prescription in Iran: a descriptive qualitative study. *Antimicrob Resist Infect Control* 2022;11:109.
5. Cunha CB. Antimicrobial stewardship programs: principles and practice. *Med Clin North Am* 2018;102:797-803.
6. CDC. Core elements of hospital antibiotic stewardship programs. Atlanta, GA: US Department of Health and Human Services, CDC; 2019. Available at <https://www.cdc.gov/antibiotic-use/core-elements/hospital.html>.
7. Hasegawa S, Livorsi DJ, Perencevich EN, Church JN, Goto M. Diagnostic accuracy of hospital antibiograms in predicting the risk of antimicrobial resistance in enterobacteriaceae isolates: a nationwide multicenter evaluation at the Veterans Health Administration. *Clin Infect Dis* 2023;77:1492-1500.
8. Sulis G, Adam P, Nafade V, Gore G, Daniels B, Daftary A, et al. Antibiotic prescription practices in primary care in low-and middle-income countries: a systematic review and meta-analysis. *PLoS Med* 2020;17: e1003139.
9. Krockow EM, Colman AM, Chattoe-Brown E, Jenkins DR, Perera N, Mehtar S, et al. Balancing the risks to individual and society: a systematic review and synthesis of qualitative research on antibiotic prescribing behavior in hospitals. *J Hosp Infect* 2019;101:428-39.
10. Majumder MA, Rahman S, Cohall D, Bharatha A, Singh K, Haque M, et al. Antimicrobial stewardship: fighting antimicrobial resistance and protecting global public health. *Infect Drug Resistance* 2020;13:4713.