

Antibiotic Stewardship

Madhavi Thara*

Department of Periodontology, Kerala University of Health Sciences, India

***Corresponding Author:** Madhavi Thara, Department of Periodontology, Kerala University of Health Sciences, India.

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Antimicrobial resistance increases morbidity and mortality for individual patients as well as pose a threat to public health. Antimicrobial resistance threatens human, animal and environmental health, killing at least 1.27 million people worldwide and is associated with nearly 5 million deaths in 2019 [1, 2]. The widespread and often inappropriate use of antibiotics is the root cause of antimicrobial resistance and it needs to be addressed urgently [3].

Drug resistance is a consequence of the evolution of microorganisms in the presence of antibiotics. The resistance is inevitable, but the pace and extent of propagation of resistant organisms can be governed by monitoring antibiotic consumption by humans and animals, hygiene, sanitation and infection control [3]. Global Antimicrobial Resistance and Use Surveillance System (GLASS) reported that ciprofloxacin resistance varies from 8.4%-92.9% for *Escherichia coli* and 4.1%-79.4% for *Klebsiella pneumoniae*. Additionally, colistin-resistant bacteria have been found in numerous locations, and are producing diseases with no effective antibiotic treatment [3, 4].

The consequences of antibiotic resistance in patients and communities create an ethical imperative to protect public health. Doctors should prescribe antibiotics judiciously and participate in antibiotic stewardship. Stewardship is an ethic that embodies planning and management of finite resources. The term antibiotic stewardship has been adopted to include initiatives that promote the responsible use of antibiotics, with the goal of preserving their effectiveness and safeguarding public health [5-8].

Antibiotic stewardship has two primary goals [9], to ensure effective treatment for patients with bacterial infection and to reduce unnecessary antibiotic use. At the patient level, stewardship has been defined as 'the optimal selection, dosage and duration of antimicrobial treatment that results in the best clinical outcome for the treatment or prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance' [10]. At the organisational level, stewardship refers to evidence-based programmes and interventions to monitor and direct antimicrobial use [11].

The goal of hospital stewardship programmes is the prevention of indiscriminate use of broad-spectrum antibiotics. The rationale includes, firstly, broad-spectrum antibiotics must be used only when they are genuinely needed thus avoiding the selection of pan-drug-resistant bacteria. Secondly, broad-spectrum agents cause extensive destruction of normal commensal flora, thereby compromising host immune function and rendering patients vulnerable to opportunistic pathogens [11, 12].

The World Health Assembly's endorsement of the Global Action Plan on antimicrobial resistance in May, 2015 was critical in the efforts to tackle antimicrobial resistance [13]. To achieve this goal, the global action plan sets out five strategic objectives, by improving awareness and strengthening surveillance and research. By reducing the incidence of infection, optimizing the use of antimicrobials and increasing investments in novel medicines, diagnostic tools and interventions.

Antibiotic stewardship includes different strategies which aim to optimize prescribing practices through either antibiotic restrictions or prospective audits of prescriptions with feedback to the clinicians. Antibiotic treatment must be prescribed only for patients with

evidence of infection and should be administered promptly. Narrow-spectrum antibiotics should be used where safe and effective thus minimizing the damage to normal flora and preserving the effectiveness of broad-spectrum agents. Antibiotic stewardship programmes includes,

- Educating and screening the patients.
- Improving hand hygiene methods.
- Using medication records and updating hospital policies.
- Monitoring and ensuring effective treatment.
- Limiting antibiotic usage [14].

To implement antimicrobial stewardship practices effectively, few organizational changes are likely required. This includes gathering data from surveillance, determining the source of infections and further introducing policies to reduce the risk of infection [14].

Antimicrobial stewardship is primarily about preventing the spread of drug-resistant bacteria in a healthcare facility. And the effective way forward is by encouraging a culture of prevention among patients and clinicians. Investigators are now exploring the use of artificial intelligence in expanding the antimicrobial agents, by modifying existing molecules and developing new drugs [14]. In addition to novel therapeutics, strict antimicrobial stewardship and monitored use of antimicrobials in humans, veterinary and agricultural fields are needed to combat antimicrobial resistance.

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