Antimicrobial Stewardship – Better late than never

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It all started in 1928 when Sir Alexander Fleming discovered first antibiotic Penicillin that produced miraculous cure in patients with infected wounds. Although he had discovered the magic bullets against bacterial infection, he knew and had very prudently warned, that the over use of this drug will lead to development of resistance. Nearly immediately, within two years, there were reports of Staphylococcal infections not responding to Penicillin.

In the early years of antibiotics, whenever resistance developed, a new drug was always available to treat the increasingly resistant bacteria. The underdeveloped and developing countries had the advantage of having newer antibacterial agent available to treat the resistant infections. Fourteen new classes of antibiotics were introduced between 1935 and 2003. But it seemed that bacteria were programmed to develop resistance within a short time to any agent that was developed. With the development in microbial sciences, we could detect genes responsible for modification in the PBPs and production of enzymes (Beta-lactamase) that would render the betalactum antibiotics useless by breaking the betalactum ring. As the time went by the scenario became grave and the medical science had to witness deaths due to extended drug resistant infections. The new drug development in the pipeline is scares. Today the situation is such that the clinicians are finding treatment of hospital acquired infections extremely difficult. WHO has declared, “Post antibiotic era”. Some of the bugs like E. coli, Klebsiella pneumonia, Staphylococcus aureus etc. are put in the list of global threats to human health by WHO. A paper published recently in lancet has analysis of deaths due to antimicrobial resistance in 23 pathogens in 204 countries. 4.95 million deaths associated with infections in 2019. 1.27 million deaths attributed to bacterial AMR. Lower respiratory infections accounted for > 15 million deaths.1,00,000 deaths attributed to MRSA [1].

Antibiotics have wide use in various fields apart from treatment of human infections like use in agriculture, veterinary and livestock preservation and that makes the situation even more difficult to control the use of antibiotics.

What is antimicrobial stewardship?

Antimicrobial 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.”

Antimicrobial stewardship is all about preserving the treatment options by appropriate use of high-end antibiotics. Every hospital should have antimicrobial stewardship team that plays a significant role in reserving the broad-spectrum antibiotics only for resistant bacteria and optimise their use. The antimicrobial stewardship has three main aims.

The first aim is to see that the patients receives the most appropriate antimicrobial with the correct dose and duration. Joseph and Rodvold [2] wrote about the 4D’s of optimal antimicrobial therapy: right **D**rug, right **D**ose, **D**e-escalation to pathogen-directed therapy, and right **D**uration of therapy.

The second aim is to prevent antimicrobial overuse, misuse, and abuse. In both the hospital and the outpatient setting, physicians should not use antibiotics when

they are not necessary, like in non-infectious processes, bacterial infections that do not require antibiotics (such as small skin abscesses that will resolve with incision and drainage)and against non-pathogen or a coloniser.

Not using broad spectrum antibiotics in community acquired infections. And the physicians should not use antibiotics especially a particular brand or group because of unethical interest. (Antibiotic Abuse)

The third aim is to minimize the development of resistance. Both at the individual patient level and at the community level, antibiotic use changes susceptibility patterns. Patients exposed to antibiotics are at higher risk of becoming colonized or infected by resistant organisms [3]. Sometimes exposures to some antibiotics can promote drug resistant C.defficilediarrhoea [4]. Frequent use of antibiotics causes selective pressure on bacterial cells leading to development of antibiotic resistance. Under the selective pressure of antibiotics like Cephalosporins and Carbapenems the chance of development of resistance is 10-20 fold high.

Antimicrobial resistance is associated with increased morbidity and mortality.

What is diagnostic Stewardship?

The hospital acquired bacterial infections like Pseudomonas aeruginosa, Klebsiella pneumoniae, Acinetobacter baumaniae, Barkholderiacepacia and Stenotrophomonas multophilaare intrinsically resistance to multiple antibiotics. Each one of them has different mechanism of resistance and they each one needs to be treated selectively. For selective therapy it is essential to isolate, identify and perform selective AST of these organisms from clinical specimens.

The diagnostic stewardship is utilization of right test at right time in right patient. The newer technological advent like molecular detection of antibiotic resistance genes from specimens, fast identification of bacterial species by methods like MLDI-TPF-MS has a significant role in bringing down the unnecessary use of antibiotics. Because of short turn-around-time the testresults are available within clinically actionable time. Such facility can be used for optimization of therapy, de-escalating or terminating antibiotic therapy.

Why antimicrobial stewardship?

Antibiotic stewardship is the need of the hour to optimize and judicious use of antimicrobials to prevent development of resistance. Antibiotic policy has been developed on national level for prophylactic, empiric and targeted use of antibacterial agents. The policy is based on nationwide surveillance of antibiotic resistance pattern of different infective agents.

It is high time for the clinicians to study the resistance pattern, use of antibacterial agents based on hospital antibiograms and education regarding the right choice of antibiotics for prophylactic, empiric and targeted treatment.

The antibiotics have saved millions of lives but now it is time to save antibiotics. It is never late for any of us to develop antibiotic stewardship team, use the technology to identify the true pathogens. Saving antibiotic today will help to save millions of lives tomorrow.

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