



INTERNATIONAL JOURNAL OF PHARMACEUTICAL RESEARCH AND BIO-SCIENCE

THE ROLE OF PHARMACIST IN LIMITING THE SPREAD OF ANTIBIOTIC RESISTANCE IN INDIA

AZIZ-UR-RAHMAN¹, SYED ABDUL MATEEN², MD SAYEED¹

Department of Pharmacy Practice. Department of Pharmacology, MESCO College of
Pharmacy, Hyderabad (AP)

Accepted Date: 28/09/2013; Published Date: 27/10/2013

Abstract: This article emphasis on Antimicrobial Resistance(AMR) in Indian health care settings and, discusses about the problem of Antimicrobial Resistance(AMR)in India and globally ,the cost of burden to the nation and worldwide, and try to explain the steps, approaches and strategies that could be taken to minimise and prevent these AMR. Simultaneously, explanation has given about Antibiotic Stewardship Program ASP) and role of pharmacist in Antibiotic Stewardship Program, in Hospitals pharmacy as well as in community pharmacy to prevent Antimicrobial Resistance (AMR).

Keywords: Antimicrobial Resistance, Antibiotic Stewardship Program, Pharmacist.



PAPER-QR CODE

Corresponding Author: Mr. AZIZ-UR-RAHMAN

Access Online On:

www.ijprbs.com

How to Cite This Article:

Aziz Ur Rahman, IJPRBS, 2013; Volume 2(5):237-245

INTRODUCTION

Antibiotics are undoubtedly among the most significant discoveries in human history. Its use has saved countless lives from once-lethal infections. Unfortunately, antibiotics are the most used and misused drugs of this era. Misuse of antibiotics is certainly a big problem, but antibiotic resistance is much broader than that, because drug resistance is a natural process, all microorganisms could eventually develop resistance to the medicines used to treat them. This issue has become one of the nations and global most pressing health problems, and its magnitude is accelerating. Antibiotic resistance is a growing problem worldwide and India too facing a massive challenge to provide better health care for its vast and growing population due to low health literacy rate and lack of basic facilities in hospitals, because more than 72% population residing in villages. India is the second most populated country in the world, with over 1.21 billion people (2011 census), more than a sixth of the world's population. Already containing 17.5% of the world's population, India is projected to be the most populated country by 2025, surpassing China, its population reaching 1.6 billion by 2050.^{1,2}

A study in 2009 by World Health Organization found that 58.7 percent of pathogenic *E. coli* samples in Delhi were resistant to the common antibiotic ciprofloxacin. In intensive care units in

India, the rate of vancomycin-resistant enterococcus (VRE), a hospital acquired infection, is five times the world average³. Why does it matter? When treatment with first-line antibiotics fails, patients have to turn to more powerful, more expensive drugs. In addition, sometimes these drugs fail, too. Antibiotic resistance leads to higher treatment costs, longer hospital stays, and in some cases, death. Antibiotic resistance is both a medical and a financial burden. A rough estimate is that 119,000 of the one million children who die each year in India within the first four weeks of life die from sepsis, or a bacterial infection that overwhelms the blood stream. Of these sepsis deaths, over 30% are attributable to antibiotic resistance. A number of medical organisations, including the World Health Organisation (WHO), have warned that, the overuse of antibiotics and the resulting evolution of resistant bacteria have caused a public health crisis.

In India there is no exact data regarding how many people are affected from this deadly problem and the estimated cost of burden to the nation but some good evidence is available for parts of Europe and from the United States. In the European Union, 25,000 people die each year as a result of infection by multidrug-resistant bacteria, at an estimated cost to health care systems of €1.5 billion per year. In the United States, while the CDC estimates that 23,000 patients a year die as a direct result

of drug resistance, it notes that a further 14,000 die every year from clostridium difficile, an infection related to antibiotic use. Medical costs attributable to drug-resistant infections are estimated at over US\$ 20 billion each year, with over 8 million additional days spent in hospital as a result. The total cost to society amounts to over US\$ 35 billion a year⁴. According to the Centres for Disease Control & Prevention (CDC), nearly 2 million people in the United States acquire bacterial infections during their hospital stay annually, and over 70% of the bacteria that cause these infections are resistant to at least one of the drugs normally used to treat them.⁵ These drug-resistant bacteria not only include methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa*, but also strains of *Klebsiella pneumoniae* that have developed resistance to all available beta-lactams.⁶ For some organisms, physicians have been forced to use polymyxins (colistin), an older class of antibiotics that was previously abandoned due to its high nephrotoxicity, *in lieu* of the "safer" aminoglycosides.⁷

Resistance in the community setting is just as concerning. The survey revealed that, community-associated MRSA was the most common identified cause of skin infections among patients who visited emergency rooms.⁸ Common pathogens seen in the community setting such as *Escherichia coli* and *Neisseria gonorrhoeae* have become resistant to fluoroquinolones, agents that were considered first-line

therapies for infections caused by these pathogens in the past.^{9, 10, 11}

The one more alarming news about the antibiotic is, about its research and development. The rate of antibiotic resistance is faster than development. As of 2009, no new classes of antibiotics were in late-stage development, and only 16 antibiotics are in late-stage development at all. Not all of these 16 agents will be approved, as evidenced by the fact that of the six that have undergone FDA review, only two were approved (telavancin and ceftaroline). The oxazolidinones (linezolid) in 2000 and the lipopeptides (daptomycin) in 2003 were the only novel systemic antibiotic classes developed since 1968.¹²

In response to control its misuse and combat antibiotic resistance, most of the hospitals in the United States and European countries started Antibiotic Stewardship program to overcome this threat. In order to fight antibiotic resistance and preserve our miracle drugs, Pharmacists play a vital role to an antibiotic stewardship program because of their understanding of how antimicrobials work the appropriate dosages and routes, and their toxicities and interactions. Pharmacists also know how antimicrobials are used in the health care system, what the available antimicrobials are, and how to fine tune the formulary, but they must have sound knowledge about the issue and actively involved in the solution.

Pharmacist-directed antibiotic stewardship programs (ASP) have proliferated

considerably in the past decade in the developed countries. After evidence revealed that these programs improve patient care, the Infectious Diseases Society of America and Society for Healthcare Epidemiology of America published a guideline for the development of ASP specifying that an infectious diseases-trained pharmacist was an essential core member.^{13,14} As resistance has increased and antibiotic development has lagged, ASP have become important to improve clinical outcomes, prevent resistance, and decrease adverse events such as *Clostridium difficile* infections.¹⁵ ASP take many forms, but all utilize a team approach to improve the utilization of antibiotics through means such as interventions on individual patients, guidelines development, and system-wide improvement. Over time, ASP may become standard for all hospitals and long-term-care facilities across the developed countries.

A joint meeting of the medical societies in India took place at Chennai in August 2012, giving rise to national recommendations and an action plan to address the challenge of antimicrobial resistance in India. The "Chennai declaration", published in November 2012, has a pragmatic achievable plan and represents a bold national commitment to antibiotic stewardship program across India.¹⁶

Importance of Antibiotic stewardship program (ASP) in India:

1. India is second most populated country in the world where more than 72.2% of population in India residing in about 638,000 villages and remaining 27.8% lives in 5100 towns and Cities.¹⁷ There is a lack of basic and hygienic practices in villages that's leads to AMR.
2. As per the Centres for Disease Control & Prevention (CDC) report 2013 antibiotics have slashed the rates of death by bacterial infection. Antibiotic resistance threatens a return to the preantibiotic era.³
3. CDC estimates that behind the 90,000 people who die yearly from hospital-acquired infections alone, 70% of the bacteria that caused these infections were resistant to at least one preferred antibiotic used to treat them. Where drug-resistant bacteria used to be found most readily in hospitals, many such infections are now found widely in communities, including methicillin-resistant *S. aureus*.³
4. In India it has become a common practice or may be due to the patient pressure to prescribe and take antibiotics for viral infections, such as some ear infections, sore throats, and sinus infections, and the common cold account for the majority of unnecessary antibiotic use.
5. As per the CDC report presented at the International Conference on Emerging Infectious Diseases in Atlanta in March, Over 50% of antibiotic prescriptions in the outpatient and Hospitals setting are estimated to be unnecessary, according to data released by the Get Smart campaign.

6. Usually antibiotics are costly medications compared to other type of medications in India, So most of the poor patients could not able to complete the duration of course because of the poverty, so incomplete duration of antibiotics leads to antimicrobial resistance.

7. Because of low health literacy rate people sometimes stop taking their antibiotics as soon as they begin to feel better and keep the antibiotics for future purpose. This misuse also brings antibiotic resistance.

8. Nationwide there is no proper system to report and alert the antimicrobial resistance and any hazardous situation that arise from misuse of it. Anyhow WHO south East Asia region started the campaign but it is in the infancy stage.

9. Nationwide including hospitals there are no strict and compulsory rules regarding antibiotic usage.

10. Inadequate facilities in healthcare systems.

11. Easy availability of antibiotics from the medical stores.

Methods:

The role of Pharmacist in Antibiotic Stewardship Program (ASP):

The pharmacists are generally the core member of ASP, following the patients and intervening when necessary. The antibiotic intervention require an in-depth knowledge of infectious diseases, others are within the scope of general pharmacy practice. The antibiotic interventions within the scope of

general pharmacy are for example about the dose and duration while selections of complex antibiotics, dose optimisation, understanding of diagnostic tests and pharmacokinetics /pharmacodynamic of antibiotics, require an in-depth knowledge of infectious diseases.

The role and responsibilities of Pharmacist in Antibiotic Stewardship Program (ASP) in Hospital pharmacy are:

1. The pharmacist is a core member of ASP multidisciplinary committee, along with other members of team he should assist in developing policy and guidelines of ASP. Together they should develop an overall plan to identify the diseases that the guidelines can cover and determine appropriate treatment option.
2. Re-evaluating antibiotic prescription after 48 to 72 hours of prescribing.
3. Advising clinician to Stop antibiotics if culture sensitivity results (CSR) shows negative and infection is unlikely.
4. Suggesting physician about stopping Antibiotics when the infection is resolved.
5. Screening of antibiotics for drug-drug interaction.
6. Suggesting physician about most appropriate antibiotics based on results.
7. Suggestion regarding improving pharmacokinetic/pharmacodynamic parameters and dose optimization of antibiotics.
8. Providing appropriate guidelines regarding empiric and prophylactic use of antibiotics.

9. Working in conjunction with ASP multi disciplinary committee to aid in the selection of diagnostic tools or tailoring susceptibility reports based on available formulary antibiotics and susceptibility reports.

10. Assisting physician in the interpretation of results from diagnostic tests or cultures (colonization vs. contamination vs. infection).

11. Advising physician to minimise the use of Broad spectrum antibiotics as this quickly leads to antimicrobial resistance.

12. As per the schedule, pharmacists should collect and report data about antibiotics interventions and its use patterns at hospital ASP committees in order to assess the effectiveness of the program.

13. The pharmacist in ASP multidisciplinary committee is bridge to the pharmacy department. He should give up to date information and explain the fellow pharmacists regarding antimicrobial resistance in hospital and educate them to dispense antibiotics as per antibiotic and prescribing privilege policies of hospital.

14. Identify well known areas for improvement within the hospital that have highest rate of antimicrobial resistance , and garner continued support for stewardship.

The role of Pharmacist to prevent antimicrobial resistance in community pharmacy as Gate way practitioner. As gateway practitioners, community pharmacists have some of the most significant opportunities to intervene and

prevent unnecessary antibiotic use, which is strongly associated with increased resistance. Patients often go to their community pharmacy first to seek advice regarding infections and OTC medications to alleviate their symptoms. Pharmacists may counsel patients on viral infections, the futility of antibacterials for them, and recommend appropriate OTC products for supportive care. Avoiding an unnecessary trip to a physician's office can prevent the pressure that physicians may feel to prescribe antibiotics that they do not believe are necessary. Of course, pharmacists should refer a patient to see a physician if a bacterial infection is suspected, the patient is severely ill or complicated by significant comorbidities, the infection is prolonged, or the pharmacist is not comfortable judging that a mild viral infection is present. A useful resource for pharmacists regarding these counselling points is the CDC Web site Get Smart: Know When Antibiotics Work.¹⁸

Education regarding infection-control practices is also another important way for pharmacist involvement in preventing AMR. Pharmacists may be proactive in regard to educating the public about important infection-control practices such as general hygiene, hand hygiene, cough etiquette(rules regarding coughing), immunizations, and staying home when sick.^{19,20} These topics may seem like common sense, but patient understanding of these basic infection-control practices should not be overestimated.

Results and Discussion:

Antibiotic resistance (AMR) is a growing problem worldwide and India also not left behind. but India faces massive challenges in providing better health care for its vast and growing population due to low health literacy rate, easy availability of antibiotics .AMR is a major threat to patient safety. Its increased hospital stay ,cost of treatment, disability, morbidity and mortality. Therefore, preventing irrational and indiscriminate use of antimicrobials, attempt to prevent AMR are vital in public and clinical health care setting. In among all these, pharmacist plays a key role by adopting various strategies in preventing AMR. Improved knowledge, adequate training and commitment of healthcare professionals are important in improving the patient's safety and minimising the AMR. Pharmacists have a responsibility to assist in the war on antibiotic resistance. They have the knowledge and resources at their fingertips to raise awareness and to act. There are multiple opportunities for pharmacists to assist in this campaign. The recognition of pharmacists as key members of antibiotic stewardship teams in health systems is a milestone in infectious-diseases pharmacy practice. Community pharmacists have a critical role to play in combating antibiotic resistance as front-line practitioners who can educate patients.

Implementing Antibiotic stewardship program in Indian health care management certainly reduce the Antimicrobial

resistance. In India, among health care profession, the pharmacists are portrayed as assistant to doctors. This is not surprising because the national health policy 2002²¹, while declaring current health care professionals levels, maintain a stoic silence about pharmacist. The Indian public health formulated under the national rural health mission (NRHM) also does not place much emphasis on the role of pharmacists as compared to other health care professionals such as nurses and laboratory technicians. In union government sixth pay commission report, pharmacist has been placed in the lowest band and structure along with other non technical persons.²²

Conclusion:

In nutshell Indian health care management is advancing and growing, with rapidly occurring changes in the health care delivery, it is hoped that the role of pharmacist will change accordingly.

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