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RESISTANCE OF SOME ANTIBIOTICS IN PUBLIC HOSPITAL

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ABSTRACT

Antimicrobial resistance is widespread at the beginning of the 21st century, it has evolved toward each class of antimicrobial drug, and appears to be spreading into new clinical niches. It has been identified determinants likely to affect the potential effects of antimicrobial-resistant infections on epidemiology and health. Ultimately, knowledge of these variables will optimize protective plans for an uncertain future. The hospital antibiogram is a periodic review of local bacterial isolates' antimicrobial susceptibilities sent to the clinical microbiology laboratory of the hospital. Antibiograms are sometimes used by physicians to determine local susceptibility rates, to assist with the selection of empirical antibiotic therapy and to track increases in resistance within an organization over time. Antibiograms may also be used to compare the rates of susceptibility across institutions and to track patterns in resistance.

KEYWORDS: Antibiotic resistance, antibiograms, Staphylococcus aureus, Pseudomonas aeruginosa, infectious diseases.

Antibiotic therapy, if indiscriminately used, may turn out to be a medicinal flood that temporarily cleans and heals, but ultimately destroys life itself."

Felix Marti-Ibanez, 1955

INTRODUCTION

In the treatment of patients with infectious diseases, facility-specific cumulative antibiograms serve many important purposes.[1] Awareness of local drug resistance rates for clinicians increases the collection of empirical antibiotics prior to culture return and susceptibility outcomes. In addition, cumulative susceptibility data are used to track changes in resistance over time, control drug-resistant species for emergence, and identify areas for hospital infection prevention and antimicromycin intervention.[2]

Antibiogram data may also enhance the systematic decisions of hospital antibiotics and local procedures, such as surgical prophylaxis or recommendations for empirical treatment.[3]

Antibiotics are organic substances formed by microorganisms that are capable of inhibiting growth or killing other microorganisms at low concentrations.[4]

The drugs were isolated from many sites, but primarily from bacteria (tetracycline, bacitracin, polymyxin, chloramphenicol, streptomycin) and fungi (cephalosporin, penicillin). The first antibiotic discovered by Sir Alexander Flemming in 1928 was penicillin. The innovative development of many more antibiotics, however, came with industrialization. The use of antibiotics since then has been.[5]

The fact that the production of antibiotic resistance would be a concern became evident shortly after the use of penicillin in clinical practice. The expanded use of antibiotics in humans and animals and the expansion of applications to areas other than disease prophylaxis and treatment have led to serious problems.[6]

There have been repeated reports of negative views about the poor chances of success in preventing the growth of antimicrobial resistance. The basic predicament is that a nonrenewable resource is antimicrobial drugs. At the biological level, their period of gain and availability seems minimal, a limitation not seen with therapies for other disease conditions.[7] From an evolutionary viewpoint, the development of antimicrobial resistance is unavoidable. In addition, for most microorganisms, it is unlikely that antimicrobial resistance fitness costs can reduce their spread and clinical effects, because subsequent evolution usually results in an increase in these costs.[8]

Mechanism of microbial resistance

The essential mechanisms of antimicrobial resistance are

(1) antibacterial drug enzymatic degradation,

(2) modification of antimicrobial target bacterial proteins and

(3) improvements in the permeability of membranes to antibiotics.[9]

Antibiotic resistance can be either mediated by plasmid or retained on the bacterial chromosome. Antibiotic hydrolysis mediated by the bacterial enzyme β-lactamase is the most critical mechanism of resistance to penicillin and cephalosporin. Chromosomal β-lactamase expression can be either induced or stably depressed by exposure to β-lactam drugs.[10]

The development of new antibiotics that are stable against β-lactamase attack and the co-administration of β-lactamase inhibitors with β-lactam drugs are methods of overcoming resistance to β-lactam antibiotics. Methicillin resistance, which is stable to gram-positive β-lactamase, occurs via the modification of the penicillin-binding protein antibiotic target protein. The key resistance mechanisms for other groups of antibiotics, including trimethoprim, sulfonamides, aminoglycosides, chloramphenicol and quinolone drugs, are the development of antibiotic modifying enzymes and the synthesis of antibiotic-insensitive bacterial targets. Reduced penetration of antibiotics is also a mechanism of resistance for many classes of antibiotics, including β-lactate.[11]

WHAT CAUSES ANTIBIOTIC RESISTANCE?

Overuse

Epidemiological studies have shown a direct relationship between antibiotic consumption and the emergence of resistant bacteria strains. In bacteria, genes can be inherited from relatives or can be acquired from nonrelatives on mobile genetic elements such as plasmids. This horizontal gene transfer (HGT) can allow antibiotic resistance to be transferred among different species of bacteria. Resistance can also occur spontaneously through mutation. Antibiotics remove drug-sensitive competitors, leaving resistant bacteria behind to reproduce as a result of natural selection. Despite warnings regarding overuse, antibiotics are overprescribed worldwide.

Inappropriate Prescribing

Incorrectly prescribed antibiotics also contribute to the promotion of resistant bacteria. Studies have shown that treatment indication, choice of agent, or duration of antibiotic therapy is incorrect in 30% to 50% of cases. incorrectly prescribed antibiotics have questionable therapeutic benefit and expose patients to potential complications of antibiotic therapy. Sub inhibitory and sub therapeutic antibiotic concentrations can promote the development of antibiotic resistance by supporting genetic alterations, such as changes in gene expression, HGT, and mutagenesis.

Extensive Agricultural Use

The antibiotics used in livestock are ingested by humans when they consume food. The transfer of resistant bacteria to humans by farm animals was first noted more than 35 years ago, when high rates of antibiotic resistance were found in the intestinal flora of both farm animals and farmers. More recently, molecular detection methods have demonstrated that

resistant bacteria in farm animals reach consumers through meat products. This occurs through the following sequence of events:

1) antibiotic use in food-producing animals kills or suppresses susceptible bacteria, allowing antibiotic-resistant bacteria to thrive;

2) resistant bacteria are transmitted to humans through the food supply;

3) these bacteria can cause infections in humans that may lead to adverse health consequences.[12]

What Is The Role of Health Communication In Antibiotic Resistance?

Antibiotic misuse and abuse is widespread across the world, increasing the risk of antibiotic resistance evolution and spread. To slow it down, a variety of actions and actors from around the world are needed. Antibiotic resistance can be slowed in four ways,: a) Avoid infections; b) Increase surveillance; c) Enhance antibiotic stewardship; d) Establish new drugs and diagnostic tests. Scholars in health communication can help with behavioral goals for infection prevention, such as encouraging seasonal influenza vaccination and good hand hygiene in public and private settings. Similarly, the lack of compliance with hand hygiene among health-care providers requires attention.[13]

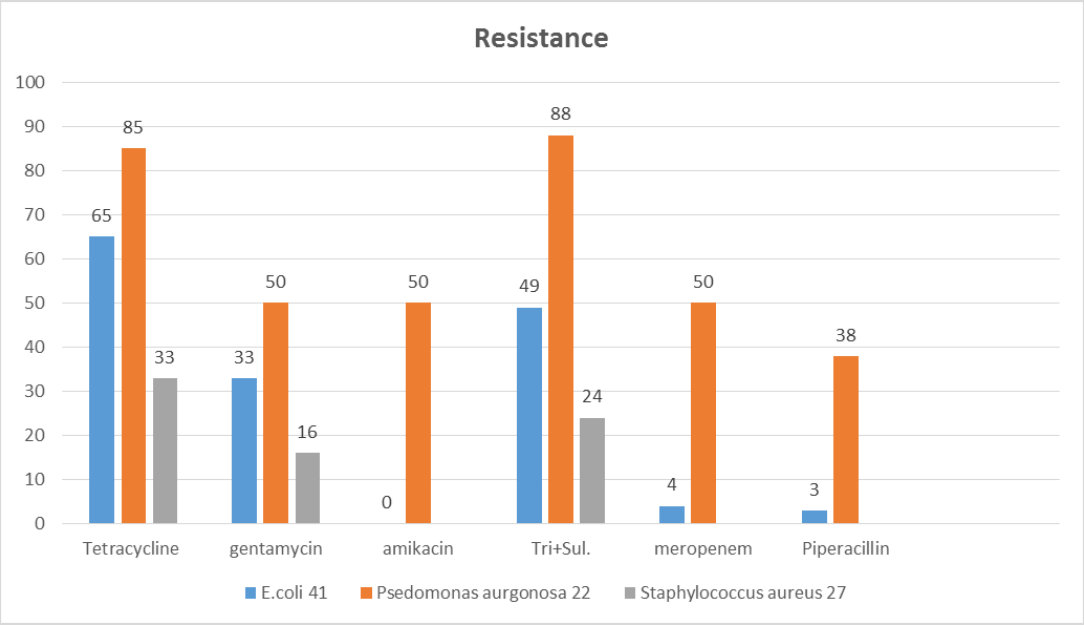
RESULTS AND DISCUSSION

E.coli: is a Gram-negative , most *E. coli* strains do not cause disease ,but virulent strains can cause gastroenteritis, urinary tract infections, neonatal meningitis, hemorrhagic colitis, and Crohn's disease

Staphylococcus aureus: is a Gram-positive, it is a common cause of skin infections including abscesses, respiratory infections such as sinusitis, and food poisoning. The emergence of antibiotic-resistant strains of *S. aureus* such as methicillin-resistant *S. aureus* (MRSA) is a worldwide problem in clinical medicine.

- ***Pseudomonas aeruginosa*** is a common Gram-negative, A species of considerable medical importance, *P. aeruginosa* is a multidrug resistant pathogen recognized, and its association with serious illnesses – hospital-acquired infections such as ventilator-associated pneumonia and various sepsis syndromes.

M.O antibiotic	E.coli Resistance/tested(41)	Pseudomonas aeruginosa (22)	Staphylococcus aureus (27)
Tetracycline	65% (24)	85% (18)	33% (21)
gentamycin	33% (39)	50% (22)	16% (21)
amikacin	0 (40)	50% (22)	
Trimethoprim+ sulphamethaxazole	49% (40)	88% (21)	24% (21)
meropenem	4% (34)	50% (20)	
Piperacillin	3% (24)	38% (18)	



Future Directions

Because of the increasing ambiguity surrounding micro- and macro-level determinants that affect antimicrobial resistance, long-term prediction is difficult. Although simulation studies can reveal short-term trends, as history has shown, making long-term predictions about the future of antimicrobial resistance is difficult. When the antimicrobial drug era began, scientists were enthralled by the milestones in antimicrobial agent production, and they made predictions about the future of antimicrobial resistance that now seem overly optimistic. In 1952, a well-known French microbiologist predicted that the antimicrobial susceptibility profiles of pneumococci, gonococci, and meningococci will not change in the future. Yet, exactly 40 years later, we were on the verge of entering the "post-antimicrobial era," in which even common infections could make doctors powerless.

So, We consider what antimicrobial resistance would look like in 2025. While predicting the course of a few major trends tends to be reasonably straightforward, other factors that lead to uncertainty pose significant forecasting challenges.[14]

CONCLUSION

Antibiotic resistance is a major public health concern, as drugs that were once highly efficacious no longer cure bacterial infections. In addition to greater morbidity, disability, and mortality, antibiotic-resistant infections contribute to other costs: They require prolonged and costlier treatments, extended hospital stays, and additional medical visits. Antibiotics are involved in cancer treatments, organ transplantation, general surgery, and a range of therapies against autoimmune diseases. The growing threat of antimicrobial resistance is fueled by complex biological, behavioral, and societal factors. , and making an antibiogram is the first step before framing the antibiotic policy. The clinical microbiology laboratory plays a critical role in formulating antibiograms and providing patient specific culture and susceptibility data. The future of antibiograms would be the incorporation of patient related data to make it more reliable and informative. The antibiogram could be useful in predicting outbreaks in a healthcare institution and in monitoring trends of antimicrobial resistance.

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