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The Rational Use of Antibiotics Medicine

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Abstract

Introduction: The abuse of antibiotics as well as the development of microbial resistance in them is a global phenomenon.

Aim: The purpose of this study is to highlight the rational use of antibiotics and limitation of microbial resistance.

Material and methods: Extensive review of the recent literature was conducted in electronic database Medline and via the link of the Greek Association of Academic Libraries (HEAL-Link), using the following key words: antibiotics, medicine, and rational use.

Results: The rational use of antibiotics is therefore it should not be random. It requires reflection and thought and should be based on rules. The correct diagnosis, the patient's condition, the location of the infection, the severity of the microbial cause sensitivities to antibiotics, the pharmacokinetics and pharmacodynamics of antimicrobials, the side effects and cost are the main elements which must be supported in every decision for their use.

Conclusion: Doctors and other professionals should prescribe antibiotics only when necessary, based on existing guidelines.

Keywords: Antibiotics; Medicine; Rational use; Pharmacodynamics

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Introduction

The overuse of antibiotics as well as the development of resistance in microbes is a global phenomenon. It concerns both the World Health Organization (WHO) and individual countries [1]. There are documented studies that support, beyond doubt, that restricting the misuse of antibiotics reduces resistance [2].

They all agree though, that the only way to reduce the resistance of antibiotics is through proper use and reducing abuse. We also all agree that in order to reduce the overuse of antibiotics simultaneous training is needed for both doctors and patients. Studies showed that unilateral intervention either by patients themselves or physicians themselves, have substantial results. So, it is now clear that the only way for the proper use of antibiotics is through intervention programs by both doctors and patients [3].

It is concluded that only by proper educational intervention for both doctors and patients by the right people with the right tools, can improve the problem of abuse of antibiotics sufficiently and to eliminate the risk of antimicrobial resistance gradually which insidiously results in major medical and social problem. Yet, times have changed and we now need to retrain patients and physicians about the proper use of antibiotics for the health of their children and their own [4].

The purpose of this study is to highlight the rational use of antibiotics to achieve optimal outcome of the infection with minimization of toxicity, reduction of costs and limitation of microbial resistance.

Material and Methods

Extensive review of the recent literature was conducted in electronic database Medline and via the link of the Greek Association of Academic Libraries (HEAL-Link), using the following key words: antibiotics, medicine, misuse and impact. An exclusion criterion of studies was the language other than the Greek and English.

Antibiotics

Antibiotics are substances that destroy the virus without harming the host, human. Etymologically, the word comes

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from the anti-biotic and means anti-against and biotic- used for life [5]. Antibiotics are either natural substances that are produced in nature by microorganisms or synthetic substances, which have been prepared in the laboratory. To be considered a clinically effective antibiotic and therefore useful in medicine, the destruction or growth inhibition of the microorganism is achieved in the respective concentrations of the antibiotic in the body [6]. To date, at least 4,000 antibiotics have been isolated from cultures of microbes and 30,000 have been prepared semisynthetic. In every day practice, however, only 100 of these are used. Apart from Medicine, they are used in Agriculture, Veterinary and Food Chemistry [7].

Antibiotics may be [8]:

- Wide spectrum kill many types of bacteria e.g. penicillin. The broad spectrum antibiotics are active against many types of microbes such as bacteria, rickettsia, mycoplasmas, protozoa, and spirochetes.
- Narrow spectrum which kill certain types of bacteria e.g. isoniazid and should be used where possible to reduce the risk of colonization and super infection with resistant bacteria.

Basically, antibiotics are classified as bactericides that kill germs, or bacteriostatic, preventing the growth of bacteria. These classifications are based on laboratory behavior of antibiotics, but in fact, both of these groups are able to treat a bacterial infection [9].

There are a number of factors which should be considered for each host when administering antibiotic formulations [10].

Genetic factors such as lack of G6PD:

- Renal and hepatic impairment are factors that will determine the type of antibiotic.
- Bactericidal drugs are necessary for life threatening infections such as sepsis.
- Diseases such as tumours, lymphomas, vasculitides and systemic diseases.
- Infections where the administration of antibiotics should be immediate because the presence of infection is life threatening. Such examples include meningitis, bacterial endocarditis, leukopenia and acute necrotizing cellulitis.

Before the administration of antibiotics, anaeroveies aerobic cultures should be taken which must be monitored because after the initial treatment, failure will therefore change initial therapeutic regimen [11].

Antimicrobial resistance

Antimicrobial resistance is the situation which occurs when the micro-organism is resistant to an antibiotic spectrum. This situation is due to changes in the genetic material of the microorganism, mutations in one or some of the genes or with a new gene, by "contamination" of the organism with plasmids, transposable elements, inegronia, and other phases [12,13]. The antimicrobial resistance is a major public health problem for many reasons [14,15]:

- It reduces the doctor's choices of treatment, limiting specific antibiotics suitable for that infection. Thus, the physician is forced to choose an antibiotic which may be expensive or perhaps more toxic and potentially moderate pharmacokinetics for a particular infection.
- It increases mortality. Many nosocomial infections are already caused by bacteria resistance to all known antibiotics and many researchers believe that we will return to the pre-antibiotic period.
- It increases human pain, infections become refractory, and the patient remains in hospital longer than they would have or are forced into the hospital, because it is necessary to use intravenous therapy.
- Legal issues are created. Already in the USA the occurrence of resistance in hospitals is considered an indicator of poor quality care services and many patients resort to lawsuits for damages [16,17].

These factors, therefore, help resistance and are summarized as [18,19]:

1. Unnecessary antibiotics.
2. Improper use of antibiotics:
    a. Smaller dose
    b. Less treatment time
    c. Incorrect dosage intervals
3. Extending the life of existing antibiotics based on the rational use, to work as little as possible in the selection pressure resistance, and in general all rational use of antibiotics. This means [20,21]:
    a. Administration of antibiotics, only for documented infection and not the common cold, for example.
    b. If an antibiotic is administered, it must be completed and not interrupted prematurely. Small doses of antibiotics are easily resistant.

The Use of Antibiotics

From 2008, at European level, the 18th November was established as Awareness Day for Rational Use of Antibiotics, and efforts are made using campaigns aimed at rationalizing and reducing the over-consumption of antimicrobial agents. Recipients of these messages are the general public to raise awareness and to reduce the consumption of antimicrobials, but above all, for health professionals at all levels of care [22].

The rational use of antibiotics is therefore, like any other therapeutic intervention in daily practice and it should not be random. It requires reflection and thought and should be based on rules. The correct diagnosis, the patient's condition, the location of the infection, the severity of the microbial cause sensitivities

to antibiotics, the pharmacokinetics and pharmacodynamics of antimicrobials, the side effects and cost are the main elements which must be supported in every decision for their use [3].

The strategy of the administration of antibiotics should be taken into account [23,24]:

- Patients with serious bacterial infections, the number of white cells are usually increased and even excel granulocytes.
- Based on the clinical picture, laboratory tests can identify the anatomical location of the infection. For example, the combination of fever, burning on urination, and increased in number of pyosfairion urinalysis indicates infection [6].
- Patients who develop an infection during their hospital stay empiric antimicrobial therapy administration should take account of the sensitivity of the flora, not only the hospital and the department (e.g., ICU, surgery, clinical pathology) which developed the infection [7].
- The remarkable ability of the micro-organisms to adapt to any environment is that each new pathogenic is resistant to antibiotics administered in the previous period.
- Patients with meningitis should not be administered antibiotics which do not pass the blood brain barrier, such as the first generation cephalosporin, gentamicin, and clindamycin. In endocarditic the tag is protected from the action of antibiotics. For this reason, the treatment should be done with bactericidal drugs at high doses and for prolonged periods [3].
- The foreign body infections, prosthetic valves, prosthetic joints, pacemakers, it is almost impossible to eradicate without removing the foreign body.
- In acute infection, patients with neutropenia, have an increased mortality from sepsis and appropriate direct intravenous therapy (taking the appropriate cultures) with broad spectrum bactericidal antibiotics at high doses.
- Older people metabolize and excrete antibiotics at a slower pace. Therefore, there should be longer intervals between the doses of antibiotics. At this age, drugs with greater toxicity, such as aminoglycosides (nephrotoxicity and ototoxicity) should be avoided [25,26].

Health professionals also need to bear in mind the following basic rules for the rational management of antibiotics [27]:

a) Too many antibiotics together may act synergistically rather than competitively. The majority of infections can be treated with an antibiotic. But there are cases where it is necessary to combine the administration of antibiotics. This is the case where a polymicrobial infection. For examples intraventricular brain abscesses and infections of the lower limbs of diabetic patients [28].

b) The use of many antibiotics results in more side effects. Adverse reactions to antibiotics are common and are divided into idiosyncratic, allergic and dose-dependent. Examples of serious allergic reactions are immediate hypersensitivity reaction to penicillin (laryngeal edema, circulatory collapse). When a patient taking many antibiotics had an allergic reaction, then all antibiotics are suspect and cannot reuse [3].

c) The use of many antibiotics increases the risk of infection with resistant micro-organisms. When many antibiotics are administered to a patient, the spectrum of micro-organisms killed is increased. The destruction of the flora of the oropharynx and gastrointestinal tract are harmful to humans. The micro-organisms that are normally found in these regions are competing to develop more resistant micro-organisms. The elimination of the normal flora of the indiscriminate use of antibiotics has resulted in the development of multiresistant pathogenic micro-organisms [29].

Also, you shouldn't [30]:

- Make people take antibiotics on their own initiative or at the instigation of others or primarily, if not prescribed by your doctor.
- The prescription of antibiotics is not necessary in every condition. If the doctor does not prescribe antibiotics do not deny that you're sick.
- The antibiotics to viral infection do not reduce the duration of symptoms or protect people around you to be none afflicted.
- When assumed by your doctor that it is necessary to administer antibiotics, they should be strictly adhered to dosage instructions and duration of your treatment.
- Follow the physician's instructions carefully in the selection of antibiotics or give the same medicine to your loved ones on your own [31].

Conclusion

Antibiotics are an essential tool of medical use in common medical procedures, such as transplantation and chemotherapy. However, over the years, bacteria have acquired resistance to antibiotics. Resistant bacteria can be transmitted from animals to humans through the food chain or by direct contact. Many bacterial infections are becoming resistant to the treatments most commonly prescribed antibiotics [32].

The resistance of pathogenic microorganisms to antibiotics not only a problem for the patient, but also for the environment as the members of the household are populated by the same pathogen and are more likely to become ill due to this.

So doctors and other professionals should prescribe antibiotics only when necessary, based on existing guidelines.

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