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PHARMACOLOGY OF ANTIBACTERIAL DRUGS IN PEDIATRICS

Abstract: The pharmacology of antibacterial drugs in pediatrics is a critical area of study due to the unique physiological and developmental differences between children and adults. This paper reviews the various classes of antibacterial agents commonly used in pediatric practice, including penicillins, cephalosporins, macrolides, and aminoglycosides. The pharmacokinetics and pharmacodynamics of these drugs in pediatric populations are discussed, emphasizing the importance of appropriate dosing and administration based on age, weight, and maturity of organ systems. The challenges of antibiotic resistance in pediatric patients are also examined, alongside guidelines for the rational use of antibiotics to minimize resistance development. Furthermore, this review highlights the importance of monitoring for adverse effects and the necessity of tailored therapeutic strategies to optimize treatment outcomes in children. By understanding the pharmacological principles guiding antibacterial therapy, healthcare professionals can improve clinical management and enhance the safety and efficacy of treatments in pediatric patients.

Keywords: pediatrics, antibiotic resistance, antibacterial drugs, community-acquired infections.

INTRODUCTION

Antibacterial drugs are among the medicines whose effectiveness, if chosen correctly, is most obvious. The advent of antibiotics in medical practice has led to a decrease in mortality in the most severe and widespread infectious diseases. The initial achievements in the use of antibiotics and the optimism associated with this fact allowed us to conclude that medicine had “victoryed” over bacteria, but the situation soon worsened with the emergence of antibiotic-resistant staphylococci and pneumococci, and subsequently gram-negative bacteria. The problem of improving the results of treating inflammatory diseases has become especially acute in the last 5–10 years, when, in the context of a rapidly expanding arsenal of antibacterial agents and pressure on the microflora, the spectrum of microorganisms and their degree of sensitivity to drugs began to change [1].

MATERIALS AND METHODS

Other equally important problems of antibiotic therapy in both outpatient and hospital pediatric practice are: physiological characteristics of childhood leading to changes in the pharmacokinetics of drugs, unreasonably frequent changes of antibiotics, prescription of irrational combinations of drugs, non-compliance with the principles of step therapy, widespread use of injectable forms of antibiotics in outpatient practice, which are not active against community-acquired pathogens. All this leads to an extension of the treatment period, its rise in cost and the absence of the expected effect of therapy, and an increase in the resistance of microorganisms. The adequacy of etiotropic therapy in pediatric practice largely determines the quality of treatment as a whole. In outpatient care, due to the rational choice of antibiotic, the duration of treatment is reduced, the likelihood of relapse and the frequency of hospitalizations are reduced. When indications for treatment with parenteral antibiotics are given, the main task is to minimize the number of injections, to ensure optimal pharmacokinetic parameters with a minimum risk of side effects. In severe situations, combinations of antibiotics are recommended,

which have proven themselves to be the most effective and practically life-saving in the most urgent situations.

RESULTS AND DISCUSSION

Optimization of antibacterial therapy in pediatrics, the use of more effective antibacterial drugs, the implementation of gentle and safe therapy regimens in children - these tasks can be effectively solved in conditions of close interaction of health authorities, clinical pharmacologists and microbiologists with the administration of medical organizations, pediatricians. Antibiotics should not be used in the treatment of uncomplicated acute viral respiratory diseases, since they do not have an antiviral effect, do not reduce temperature and do not prevent the development of bacterial complications. It is necessary to pay attention to the issues of diarrhea diagnostics in children. The main cause of acute diarrhea is an infection, most often of viral etiology (rotavirus, etc.). Chronic diarrhea, as a rule, is of non-infectious nature. The need for a diagnostic search for the causes of diarrhea in children is due to the importance of therapy for the underlying disease. Diarrhea in pediatric practice is not an indication for antibacterial therapy. Unreasonable use of antibiotics can lead to increased bacterial resistance, an increased risk of adverse drug reactions, disruption of normal microflora, and an increase in treatment costs.

Absolute indications for prescribing antibiotics in outpatient practice are [2]:

1. Acute streptococcal tonsillitis.

2. Acute otitis media (in children under 6 months).

3. Acute purulent sinusitis.

4. Acute and chronic sinusitis.

5. Paratonsillitis.

6. Epiglottitis.

7. Pneumonia.

A differentiated approach to prescribing antibiotics is required:

1. Acute otitis media in children over 6 months.

2. Exacerbation of chronic tonsillitis.

Principles of using antibacterial drugs in pediatric patients

An indication for antibacterial therapy is the presence of an infectious and inflammatory process in a child of a highly probable or proven bacterial nature, requiring adequate antibacterial therapy, since there is a high probability of developing severe complications and unfavorable outcomes (except for limited cases of antibiotic prophylaxis). The antibacterial therapy regimen should be based on either etiotropic or empirical therapy.

Etiotropic therapy is more rational and implies targeted antibiotic therapy based on isolating the pathogen from the site of infection and determining its sensitivity to antibiotics. Rapid tests (for

example, identification of group A streptococcus) help to obtain a quick result on the identification of the microorganism. But in routine practice, obtaining the results of the study can take from 2 to 7 days, which is why empirical antibacterial therapy is most often carried out. Empirical therapy is a scheme based on the presumed diagnosis and localization of the infectious process before receiving information about the pathogen and its sensitivity to these drugs. It is carried out taking into account the most likely pathogens of this infection and the expected sensitivity to antibiotics.

CONCLUSION

Anatomical and physiological characteristics of childhood significantly affect the prevalence of certain infections, their clinical manifestations and diagnostics. In the practice of a district pediatrician, acute respiratory infections are the leading pathology both among infectious diseases of the respiratory system and among childhood diseases in general. Knowledge of the sensitivity spectrum of a microorganism is the basis for the correct use of antibacterial drugs. It is for this purpose that it is necessary to establish routine, reliable identification of pneumococci, Haemophilus influenzae, pyogenic streptococci and determination of their sensitivity based on international standards in outpatient laboratories.

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