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РЕЗИСТЕНТНОСТЬ STREPTOCOCCUS PNEUMONIAE К АНТИБИОТИКАМ У ДЕТЕЙ

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STREPTOCOCCUS PNEUMONIAE RESISTANCE TO ANTIBIOTICS IN CHILDREN

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Резюме. Streptococcus pneumoniae (S. pneumoniae) остается одним из наиболее важных патогенов, вызывающих детские инфекции. Распространение бактерий, устойчивых к антибиотикам, является основной причиной неэффективности лечения у детей.

Ключевые слова: Streptococcus pneumonia, антибиотики, резистентность, дети.

Resume. Streptococcus pneumoniae (S. pneumoniae) remains one of the most important pathogen causing childhood infections. The spread of antibiotic-resistant bacteria is a leading cause of treatment failure in children.

Keywords: Streptococcus pneumonia, antibiotics, resistance, children.

Relevance. S. pneumoniae is a Gram-positive bacterium responsible for a variety of invasive and non-invasive diseases. In addition to this, it also constitutes a leading cause of morbidity and mortality, especially among children younger than 5 years of age [1].Every year, 1.6 million people die from diseases caused by pneumococcus worldwide, of which 0.7-1 million are children under 5 years of age [2]. Generally, children carrying S. pneumoniae are generally asymptomatic, but under certain circumstances they may develop non-invasive infections (moderate uncomplicated pneumonia, acute purulent otitis, sinusitis) or severe invasive infections (bacteremia, pneumococcal sepsis, purulent meningitis, severe, complicated community-acquired pneumonia), requiring hospitalization of the patient in the intensive care unit. Antibiotics have solved the problem of treating different infectious diseases, but the rapid rise in antibiotic resistance has affected their effectiveness in recent decades, and even more so in recent years [3]. ßeta-lactams (ß-lactams) are first line antibiotics prescribed for the treatment of S. pneumoniae diseases [4]. The spread of antibiotic resistance is actually known as a serious health issue. Resistance of pneumococci to β-lactams is not due to the action of β-lactamases, but to modification of penicillin-binding proteins. Resistance to 14- and 15-membered macrolides is due to active excretion - efflux, to all macrolides - modification of ribosomes by methylase. After a pneumococcal infection, a low-intensity, short-term, type-specific immunity is formed, which does not protect against re-infection with another pneumococcal serotype.

Aim: in the present study, we aim to determine the antibiotic resistance and multiple drug resistance profiles of S. pneumoniae strains isolated from children in Minsk, Republic of Belarus.

Objectives:

1. Analysis of S. pneumoniae resistance and sensitivity to antibiotics in different patients.

2. Determine the right strategy to treat patients with a S. pneumoiae infection.

Materials and methods. The sensitivity/resistance of S .Pneumoniae was analyzedbased on the results of culture of smears from the nose and throat, from the ear canal for flora and sensitivity to antimicrobial drugs in 102 children of different ages treated in the Children's City Infectious Diseases Hospital of Minsk with respiratory tract diseases, otitis in the period from January 9 to September 19, 2024. Smears were collected from children with various diseases: otitis (n = 56), acute respiratory infections (n = 36), pneumonia (n = 8), tonsillitis (n = 2). In the bacteriological laboratory of the Children's City Infectious Diseases Hospital of Minsk, a bacteriological study was carried out using: an apparatus method of serial dilutions, a disk diffusion method with determination of the sensitivity/resistance of S .pneumoniae to antimicrobial drugs :Vancomycin ;Linezolid; Erythromycin ;Imipenem ;Levofloxacin ;Azithromycin ;Sulfatrim ;Amoxiclav ;Penicillin; Tetracycline; Clindamycin ;Cefotaxime ;Chloramphenicol ;Ceftriaxone ;Moxifloxacin.

Results and their discussion. In patients with otitis (56 patients), all S. Pneumoniae isolates were susceptible to Vancomycin, Imipenem, Amoxiclav, Moxifloxacine, followed by Cefotaxime (98,1%), Linezolid (98%). The highest level of resistance was detected to Erythromycine (69,4%).(diagram 1).

In patients with acute respiratory infections (36 patients), all S. pneumoniae isolates were susceptible to Vancomycin, Linezolid, Imipenem, Levofloxacin, Penicillin, Cefotaxime, Chloramfenicol, Ceftriaxone. The highest rate of resistance was detected to Azithromycin (75%), followed by Erythromycin (71,4%) (diagram 2).

In patients with pneumonia (8 patients), a 100% susceptibility was detected to all the isolates except to Erythromycin, Levofloxacin (75%) and to Azithromycin with a high resistance of 66,7% (diagram 3).

In patients with tonsillitis (2 patients), a 100% susceptibility was detected to Linezolid, Imipenem, Levofloxacine, Amoxiclav, Cefotaxime and Ceftriaxone. A 100% resistance was detected to Azithromycin.

Upon all children of this study, all S. pneumoniae isolates (n=102) were susceptible to Vancomycin and Imipenem. Streptococcus pneumoniae was highly susceptible to Linezolid and Cefotaxime (98.9%), Amoxicillin/Clavulanic acid (97.1%), Ceftriaxone (96.9%), Chloramphenicol (95.7%), Moxifloxacin (94.11%), Levofloxacin (94.3%). Streptococcus pneumoniae susceptibility to Co-trimoxazole was 75%. The highest level of S. pneumoniae resistance was found to Erythromycin (67.3%), followed by Azithromycin (63.9%). The level of resistance of S. pneumoniae exceeding 30% was detected to Tetracycline and Clindamycin (33.3% each, respectively), Penicillin (31.2%) (diagram 4).

Conclusion:

1. Difficulties in treating children with illnesses caused by Streptococcus pneumonia may be attributed to the insufficient efficacy of prescribed antimicrobial therapy (especially in the case of macrolide prescription).

2. The priority for choosing antimicrobial therapy is to prescribe drugs with an optimal spectrum of antibacterial activity for a specific patient, taking into account the level

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of acquired resistance of pathogens in the population, for example, Amoxicillin/Clavulanic acid, second- and third-generation cephalosporins.

3. In case of hypersensitivity to beta-lactam antibiotics, it is necessary to discuss the possibility of prescribing reserve antibiotics (Linezolid, Vancomycin) to children with invasive pneumococcal infection.

4. It is extremely important to vaccinate children against pneumococcal infection according to the vaccination schedule, as well as patients at risk.

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