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ON THE ISSUE OF KLEBSIELLA PNEUMONIAE RESISTANCE IN YOUNG CHILDREN WITH CONGENITAL HEART DEFECTS

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Abstract:A prospective study was conducted to study resistance in Klebsiella pneumoniae in the intensive care unit of young children. It was revealed that resistance to III-IV generation cephalosporins, fluoroquinolones, aminoglycosides is caused by the production of extended spectrum β-lactamases (ESBLs), and to carbapenems due to a decrease in the permeability of the cell membrane in combination with the production of ESBLs. The characteristics of patients colonized with multi-resistant K. pneumoniae strains were identified.
Keywords:K. pneumoniae, sustainability, antibiotics, Extended spectrum β-lactamases.

INTRODUCTION: Klebsiella pneumoniae is one of the leading causative agents of nosocomial infections (NI), it causes from 2 to 20% of all nosocomial infections [1, 4]. In Uzbekistan, K. pneumoniae is the third most common gram-negative pathogen of NI. In a number of hospitals, Klebsiella is the predominant causative agent of NI, ranging from 24.5 to 43.6% [2]. One of the main clinically significant mechanisms of acquired resistance to β-lactams in K. pneumoniae is multiple resistance caused by the production of ESBLs [1, 3]. Carbapenems, primarily imipenem and meropenem, have the greatest stability to the action of ESBLs [1–4]. Currently, strains of K. pneumoniae resistant to carbapenems have been reported. To the mechanisms that determine stability
Carbapenems include both the production of β-lactamases of various molecular classes and the combination of ESBLs with reduced permeability of the cell membrane [3].
MATERIALS AND METHODS: In 2023, we conducted a prospective study to study the mechanisms of resistance in K. pneumoniae isolated from young children requiring treatment in an intensive care unit (ICU). The study included pediatric ICU patients colonized and with infections caused by K. pneumoniae. A total of 33 strains isolated from 27 patients were studied. The analysis included all successively isolated strains of K. pneumoniae in 2023. K. pneumoniae with the same resistance (susceptibility), repeatedly isolated from one patient, were excluded from the analysis.
RESULTS AND DISCUSSION: The strain isolated first was analyzed. Strains with moderate resistance (susceptibility) were classified as resistant. Pure cultures of K. pneumoniae were used to determine sensitivity. Sensitivity was studied using disks impregnated with antibiotics (BioRad, USA) on Mueller-Hinton agar (BioMerrier, France) using the disk diffusion method in accordance with the recommendations of the National Committee for Clinical and Laboratory Standards of the USA and Methodology - any instructions for determining the sensitivity of microorganisms to antibacterial drugs. Determination of ESBL production by K. pneumoniae strains using the double disk method using disks with amoxicillin/clavulanate (20/10 μg), cefotaxime (30 μg), ceftazidime (30 μg). Carbapenem resistance was studied using discs impregnated with meropenem (10 μg) and imipenem (10 μg).
To detect metallo-β-lactamase (MBL), the synergy method between imipenem (10 μg), meropenem (10 μg), ceftazidime (30 μg) and ethylenediaminetetraacetic acid (EDTA) was used.
Among the studied K. pneumoniae, the prevalence of strains resistant to β-lactam antibiotics was recorded ranging from 3 to 87%. The highest frequency was observed for third- and fourth-generation cephalosporins (cefotaxime and ceftriaxone - 87%, ceftazidime - 81%, cefepime - 78%), somewhat less frequently for inhibitor-protected penicillins (amoxicillin/clavulanate - 48%) and cephalosporins (cefoperazone/ sulbactam – 63%). The lowest frequency of resistant strains of K. pneumoniae was registered for carbapenems. At the same time, the greatest activity was observed in imipenem (resistance 6%), two strains were insensitive to it. Resistance to meropenem was 15% (5 strains). All strains were classified as moderately sensitive (Table 1).

Table 1

Antibiotic resistance of K. pneumoniae, n = 33

Antibiotics	Sensitivity, %	Moderate sensitivity, %	Stability, %
Amoxicillin/clavulanate	46	6	48
Ceftriaxone	13	—	87
Cefotaxime	16	—	84
Ceftazidime	16	3	81
Cefoperazone/sulbactam	28	9	63
Cefepime	22	—	78
Imipenem	94	3	3
Meropenem	85	15	15
Ciprofloxacin	43	—	57
Amikacin	64	6	30
Netilmicin	61	6	33

In our study, in 73.7% of cases, producers were insensitive to ciprofloxacin, in 26.3% to amikacin, and in 31.6% to netilmicin. All Klebsiella resistant to III–IV generation cephalosporins were sensitive to imipenem and meropenem, the drugs of choice for empirical treatment of severe and life-threatening infections [1, 2, 4, 9]. Currently, carbapenem-resistant K. pneumoniae are registered in North America, Greece, Turkey, Israel, and India [4].

CONCLUSION: This prospective study allowed us to identify carbapenem-resistant K. pneumoniae in young children with complex congenital heart disease who require long-term treatment in the ICU after cardiac surgery. In 71.4% of cases (5 patients), patients had previous hospitalization in the ICU and received broad-spectrum antimicrobial therapy. In the medical history of three (42.8%) patients there was evidence of the isolation of ESBL-producing Klebsiella during a previous hospitalization. This fact suggests that young children with complex congenital heart disease, who require long-term therapy in the ICU after cardiac surgery and who have a history of previous hospitalization, are at increased risk for isolating carbapenem-resistant strains of K. pneumoniae.

REFERENCES

1. Galkin D.V. // Wedge. microbiol. antimicrobial chemotherapy 2017. Vol. 9, No. 2. pp. 133–152.
2. Ryabkova E.L. Optimization of antibiotic therapy for nosocomial infections caused by Klebsiella pneumoniae in Russian hospitals: abstract. dis. Ph.D. honey. Sci. Smolensk, 2016.
3. Strachunsky L.S. // Wedge. microbiol. antimicrobial chemotherapy 2015. T. 7, no. 1. pp. 92–96.
4. Eidelshtein M.V. // Wedge. microbiol. antimicrobial chemotherapy 2011. T. 3, no. 3. pp. 15–29.