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Research Article

A Study of Antibiotic Resistance of Bacteria Isolated from Patients of the Bonadea Hospital

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Abstract

Comparative analysis of the etiological structure and antibiotic resistance of infectious agents isolated from various sources.

High rates of growth of multiple antibiotic resistance of bacteria actualize the problem of antibiotic therapy of nosocomial infections. In this article, the etiological structure and resistance properties of bacteria obtained from various sources have been studied. Based on the data obtained, it is recommended to develop protocols for empirical antibiotic therapy for each specific hospital.

Keywords: Antibiotic Resistance; Etiological Structure; Infections

Introduction

The inefficient use of antibiotics and the development of antibiotic-resistant bacterial strains is one of the most serious health problems. According to the WHO, the use of antibiotics is unnecessary and inappropriate in about 75% of cases [1,9,10]. The concept of inadequate use of antibiotics includes both their unnecessary appointment, unreasonable prolongation or shortening of the course of treatment, and the use of broad-spectrum antibiotics without identifying the etiological agent of the infection [2,5].

Patients infected with bacteria resistant to infectious diseases have more negative clinical outcomes and a higher risk of death than patients infected with non-resistant strains of the same bacteria, while consuming more medical resources. Recently, the concept of "superbacteria" is on the agenda [6,7]. The term also refers to bacteria that are resistant to different classes of antibiotics. Scientific publications have shown that bacteria such as *Acinetobacter, Burkholderia, Campylobacter, Citrobacter, Clostridium, Enterobacter, Enterococcus, Haemophilus, Klebsiella, Proteus, Pseudomonas, Salmonella spp., Serratia, E. coli, Staphylococcus. aureus, S. epidermidis* and *Streptococcus pneumoniae* have already developed resistance to many antibiotics (multidrug-resistant - MDR).

Given the high rates of multidrug resistance, there are many unresolved issues in the field of antibiotic therapy for nosocomial infections [3,4,8]. From this point of view, there is a need to study in detail the etiological structure of various bacterial infections and to develop effective treatment regimens.

The aim of this study is to study the etiological structure of the pathogens detected in patients at Bonadea Hospital and their resistance to antibiotics.

Materials and Methods

In July-September 2020, 61 patients underwent bacteriological examination at Bonadea Hospital. Samples of sputum, blood, urine, bile and wound discharge were examined. Identification of pathogens was carried out with an automated microbiological analyzer Vitek2 and mass spectrometry microbiological identification system Vitek Ms.

Results and Discussion

At the time of examination, 14 patients (22.9%) had *Klebsiella pneumonia*, 16 patients had (26.2%) *Escherichia coli*, 10 patients (16.3%) had *Pseudomonas aeruginosa*, 6 patients (9.8%) had *Acinetobacter baumannii*, and 2 patient (3.3%) *Klebsiella oxitoca*, 4 pa-

tients (6.5%) *Enterococcus faecalis*, 3 patients (4.9%) *Staphylococcus aureus*, 3 patients (4.9%) *Citrobacter freundii*, 1 patient (1.6%) *Burkholderia vietnamiensis*, 2 patients (3.3%) *Enterobacter cloacae* pathogens were detected.

Associations of *Ps. aeruginosa* and *St. aureus* were observed in 4.9% of clinical cases, and Ps. aeruginosa and Kl. pneumonia in 9.8% of cases. *Enterococcus faecalis* and *Enterobacter cloacae* bacteria were found together in one patient.

Kl. pneumonia strains were detected in 21.4% of cases in wound samples, in 50% of cases in samples taken from the respiratory tract (tracheal aspirate, bronchoalveolar lavage), in 28.6% of cases in urine.

E. coli strains were found in 25.0% of cases in wound, 43.7% in urine, 18.8% in blood and 12.5% in bile.

The following results were obtained when determining the susceptibility of microorganisms to antibiotics.

Pathogens or Antibiotics	*Kl.pneumonia*		*E.coli*		*Ent.faecalis*	
	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant
Amikasin	71.4%	28.6	68,8	31,2	25	75
Amoxicillin/ Clavulanic acid	21.4	78.6	12,5	87,5	25	75
Ampisillin	0	100	0	100	0	100
Cefazolin	7.2	92,8	-	-	-	-
Cefoxitin	0	100	6,3	93,7	-	-
Ceftazidime	7.2	92,8	12,5	87,5	25	75
Ciprofloxacin	7.2	92,8	12,5	87,5	0	100
Colistin	71.4	28.6	68,8	31,2	25	75
Gentamicin	71.4	28.6	50	50	25	75
Meropenem	71.4	28.6	75	25	25	75
Nitrofurantoin	7.2	92,8	68,8	31,2	-	-
Norfloxacin	7.2	92,8	25	75	50	50
Piperacillin	35.7	64.3	68,8	31,2	-	-
Trimethoprim-Sulfamethoxazole	71.4	28.6	50	50	75	25

Table 1: Sensitivity of bacterial strains to various antibiotics, %.

Pathogens/Antibiotics	*St.aureus*		*A.baumanni*		*C. freundi*		*Ps.aeruginosa*	
	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant
Amikasin	0	100	33,3	66,7	66,6	33,3	30	70
Amoxicillin/ Clavulanic acid	33,3	66,6	33,3	66,7	66,6	33,3	40	60
Ampisillin	0	100	0	100	0	100	0	100
Cefazolin	33,3	66,6	33,3	66,7	0	100	20	80
Cefoxitin	0	100	50	50	0	100	40	60
Ceftazidime	33,3	66,6	16,6	84,4	0	100	10	90
Chloramphenicol	-	-	-	-	-	-	20	80
Colistin	0	100	66,7	33,3	66,6	33,3	70	30
Gentamicin	0	100	0	100	33,3	66,6	60	40
Meropenem	33,3	66,6	66,7	33,3	66,6	33,3	90	10
Nitrofurantoin	0	100	0	100	-	-	10	90
Norfloxacin	-	-	33,3	66,7	-	-	20	80
Piperacillin	33,3	66,6	50	50	33,3	66,6	30	70
Trimethoprim-Sulfamethoxazole	66,6	33,3	66,7	33,3	66,6	33,3	60	40

Table 2: Sensitivity of bacterial strains to various antibiotics.

The results showed that some enterobacteria - *Kl. pneumonia* and *E. coli* - were unexpectedly resistant to fluoroquinolones (ciprofloxacin and norfloxacin) while being sensitive to amikacin and gentamicin drugs of the second and third generations of aminoglycosides. Meropenem belonging to the class of carbapenems has a high bactericidal effect on the studied enterobacteria (*Kl. pneumonia*, *E. coli*, *C. freundii*) and non-fermenting bacteria (*A. baumannii*, *Ps. aeruginosa*). The bactericidal effect of colistin on all gram-negative bacteria studied in the current study was determined.

The detection of resistance to enterobacteria and *Staphylococcus aureus* strains to amoxicillin/clavulanic acid is a matter of concern.

Recent studies by many authors on the resistance of *Staphylococcus aureus* strains have shown that *St. aureus* cultures are resistant to most of the antibiotics we have studied.

Both gram-negative and gram-positive bacteria studied in this study were quite sensitive to Trimethoprim-Sulfamethoxazole.

Conclusion

The issue of different levels of resistance of bacteria highlights the need for regular monitoring of the etiological spectrum of pathogens and antibiotic susceptibility in different hospitals.

In this regard, taking into account the etiological structure of the pathogens of various pathologies and antibiotic resistance properties, it is recommended to develop a protocol of empirical therapy with antibiotics in each large hospital.

Conflict of Interest

The authors declare no conflict of interest.

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