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The Point Prevalence Survey Research of Antibacterial Drugs' Prescription for Outpatient Treatment of Urinary System Infections

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Keywords: PPS-research; Antibiotic resistance; Urinary tract infections; Prescription; Treatment; Choice of antibiotic drugs

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Abstract

BACKGROUND: Antibiotic resistance of microorganisms is the subject of numerous discussions and initiatives, it has a well-defined tendency to increase which is largely related to a big number of errors when prescribing antibacterial drugs at the outpatient stage of treatment and disease prevention, as well as a lack of information and data on the quantity and quality of antimicrobial therapy. One of the elements aimed at reducing antibiotic resistance growth is audit and analysis of application practice.

AIM: To assess qualitative and quantitative characteristics for urinary tract infections treatment using antimicrobial drugs by general physicians at the outpatient level.

MATERIALS AND METHODS: The Point Prevalence Survey (PPS) analysis of antimicrobial drugs prescription was conducted by general physicians of No. 1, 4, 5 Hospitals of Karaganda city. There was carried out a daily prospectively data collecting on antibacterial drugs prescription by Doctor of Medical institutions, which was performed during patients' visit. For each person who was prescribed the AD, there was filled a special questionnaire developed by the European Center for Disease Prevention and Control, including passport data, data on disease and prescription of antibacterial drugs. There were considered 200 cases of antibiotic prescription. The study included patients of both sexes, all age groups, who were prescribed the antibiotic therapy for the UTI treatment.

RESULTS: When selecting antimicrobial therapy, the Protocols for diagnosis and treatment indicate the need for a microbiological study to determine sensitivity to antibacterial drugs, that was not performed in 100% of cases, and initial treatment was empirically prescribed, namely, in 34% of cases there were used drugs from the cephalosporin group (Ceftriaxone), nitrofurans (Furazidin)-42%, fluoroquinolones (Levofloxacin)-24%. In treating acute cystitis, in most cases, alternative medications were prescribed, though according to current recommendations, first-line therapy includes fosfomycin trometamol, pivmecillins and nitrofurantoin macrocrystals, which according to the results of this study were not used at all.

CONCLUSION: In most cases (71%), alternative antibacterial drugs were prescribed for initial treatment of urinary tract infections. In majority cases, the dosage regimen of antibacterial drugs, dosage frequency, treatment course did not meet current recommendations.

Introduction

The number of urinary system diseases in the Republic of Kazakhstan tends to continuous growth, mainly due to urinary tract infections (UTI). So, in 2015, the overall incidence in this nosological category was 7532.2, in 2016-8784.8, in 2017 - 8765.7 per 100,000 people. In absolute numbers, the statistics is the following: 2015-1321460 persons, 2016-1563158 persons, 2017-1581114 persons [1], [2].

Every year in the US, more than 7 million people with the UTI symptoms are seeking specialised medical assistance, and about 15% of all prescribed antibacterial drugs (AD) are used specifically by a group of childbearing age female patients. A similar trend is observed in Western European countries. Among childbearing age women, the UTI is diagnosed ten times more often than in

men. Nearly half of women in this age group have had the UTI during their life with every third woman under the age of 24, and from 20 years old before menopause women's cystitis is diagnosed 50 times more often than in men, which indicates the need to improve the diagnosis and treatment of the UTI in women, which is also important in periconceptional supplementation due to strong correlation with infectious diseases of the pelvic organs, especially when the infection is generalized [3]. Besides, savings by reducing antibiotics costs may be greater than the cost of intervention or program (from $ 200,000 to $ 900,000, depending on the study) [4], [5].

According to numerous studies, the etiological factor in approximately 70 – 85% of cases are Enterobacteriaceae. The remaining pathogens (Staphylococcus saprophyticus, Pseudomonas aeruginosa, Enterococcus faecalis) are much less common [6], [7], [8]. Today, the literature suggests the choice of therapy drugs for urinary tract infections are cephalosporins of the II-III generations, fluoroquinolones and aminoglycosides, which indicates an increase in resistance [3].

Antibiotic resistance of microorganisms is the subject of numerous discussions and initiatives [9], it has a well-defined tendency to increase which is largely related to a big number of errors when prescribing antibacterial drugs at the outpatient stage of treatment and disease prevention, as well as a lack of information and data on the quantity and quality of antimicrobial therapy. One of the elements aimed at reducing antibiotic resistance growth is audit and analysis of application practice.

The Point Prevalence Survey (PPS) is the most appropriate tool for monitoring doctors' actions regarding antibiotics. The PPS is pointed prevalence study which allows identifying the goals of doctors in charge of diseases therapy. At the same time, the points prevalence means the number of people with a certain characteristic in a selected period of the relatively interested population for researchers. The Global Prevalence Study (Global PPS) on consumption and antimicrobial resistance was developed after the Fourth Worldwide Forum on Infections and Antimicrobial Resistance. Its goal was to assess the international prevalence of antimicrobial use and resistance with a focus on countries with low resources, support and experience [10]. The project was based on the results of three-pointed prevalence studies conducted by the European antimicrobial consumption supervision in 2006 and 2009 [11], [12].

Many modern studies have brought into sharp focus that the PPS analysis is a valid method of rationality assessment for antimicrobial therapy prescribing in each medical institution [13], [14], [15], [16], [17]. Several studies [18], [19], [20], [21] on applicability and benefits of the antimicrobial use prevalence points survey have shown its value within the range of European hospitals. In addition, the European supervision of antimicrobial consumption network methods have been adapted for the European Center for Disease Prevention for the use of antimicrobial agents in emergency hospitals [22] and determination the antibiotic resistance in the European children's project which focuses on antimicrobial drugs for children and newborns worldwide [23], [24], [25]. Thus, to prevent resistance growth, it is necessary to conduct an analysis for rational antibiotics uses based on valid methods.

Purpose of the study: to assess qualitative and quantitative characteristics for urinary tract infections treatment using antimicrobial drugs by general physicians at the outpatient level.

Material and Methods

The Point Prevalence Survey (PPS) analysis of antimicrobial drugs prescription was conducted by general physicians of No. 1, 4, 5 Hospitals of Karaganda city. There was carried out a daily prospectively data collecting on antibacterial drugs prescription by Doctor of Medical institutions, which was performed during patients' visit. For each person who was prescribed the AD, there was filled a special questionnaire developed by the European Center for Disease Prevention and Control [26], including passport data, data on disease and prescription of antibacterial drugs. There were considered 200 cases of antibiotic prescription. The study included patients of both sexes, all age groups, who were prescribed the antibiotic therapy for the UTI treatment.

Results

In the research, 200 cases of the AD prescription for urinary tract infections therapy were considered. The survey included 161(80.5%) women and 39 (19.5%) men.

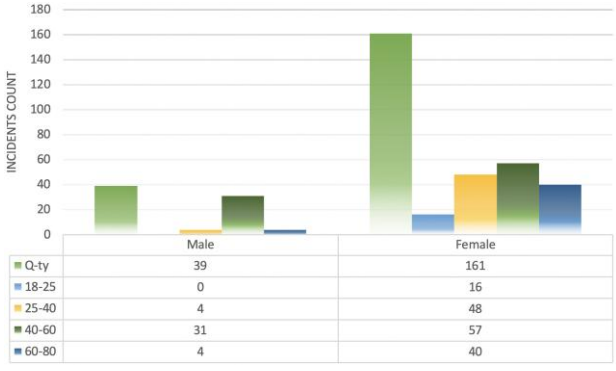


Figure 1: Sex-age structure of those under study by groups

One hundred twenty-one persons under study (75%) are related to the childbearing age women category. Their sex-age structure by groups is provided in Figure 1.

As the Figure indicates, women are 4 times more than men which corresponds to literary data [3].

When analysing the obtained data, there was data homogeneity: most often antibacterial drugs were prescribed by general physicians in the Hospitals No. 1, it is 46% of cases, in the Hospitals No. 4 and No. 5 it is 31% and 23% respectively. The structure of the nosology is shown in Figure 2.

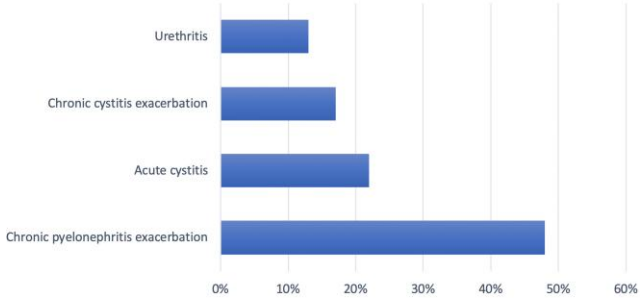
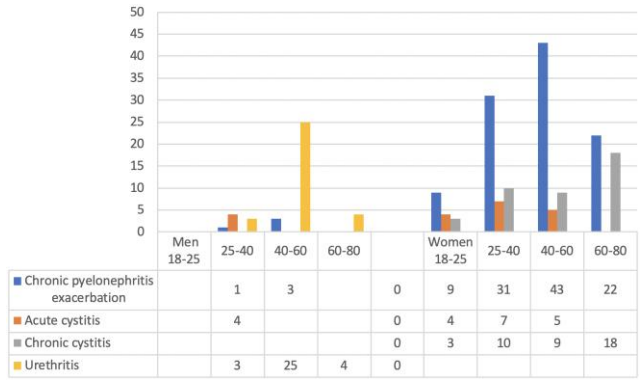


Figure 2: Urinary tract infections structure

The most common reason for antibiotics prescription was a chronic pyelonephritis exacerbation; it is 48%.

Figure 3 shows the UTI disease incidence in men of different age groups. As can be seen, in most cases, urethritis occurs in 40 – 60 years old men, which corresponds to modern data [27].



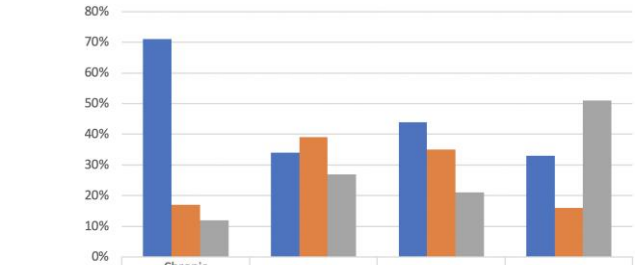
	Men 18-25	25-40	40-60	60-80		Women 18-25	25-40	40-60	60-80
Chronic pyelonephritis exacerbation		1	3		0	9	31	43	22
Acute cystitis		4			0	4	7	5	
Chronic cystitis					0	3	10	9	18
Urethritis		3	25	4	0				

Figure 3: The incidence of UTIs in different age groups

In women of all age groups, the chronic pyelonephritis exacerbation is most common, which corresponds to the literature data (Figure 3) [3].

When selecting antimicrobial therapy, the Protocols for diagnosis and treatment indicate the need for a microbiological study to determine sensitivity to antibacterial drugs, that was not performed in 100% of cases, and initial treatment was empirically prescribed, namely, in 34% of cases there were used drugs from the cephalosporin group (Ceftriaxone), nitrofurans (Furazidin)-42%, fluoroquinolones (Levofloxacin)-24%.

Figure 4 shows the prescription of different antibiotics for urinary tract infections treatment.



	Chronic pyelonephritis exacerbation	Acute cystitis	Chronic cystitis	Urethritis
Nitrofurans	71%	34%	44%	33%
Cefalosporins	17%	39%	35%	16%
Fluoruquinolones	12%	27%	21%	51%

Figure 4: Prescription frequency of different antibiotics for urinary tract infections treatment

In case of chronic pyelonephritis exacerbation, in most cases (71%) (Figure 4) there were used nitrofurans 100 mg, 4 times a day, the treatment was 7-10 days, although according to the literature they are not the first-choice drugs (Table 1) [3].

Table 1: Dosing Schedule, frequency and treatment course of different antibiotics

Drug	Dosage, mg (day)	Number of cases	Dosage frequency	Administration route	Treatment course, days
Levofloxacin	500	48	1	orally	none
Ceftriaxone	1000	60	2	parenterally	7
	2000	8	1	parenterally	none
Furazidin	100	68	4	orally	10
	100	16	4	orally	7

Cephalosporins (Cefriaxone) were prescribed only in 17% of cases (Figure 4), the drug dosage varied from 1000-2000 mg 1-2 times a day, the course lasted for 7 days, although according to literature data, the 2-3 class cephalosporins are alternative-choice drugs: Cefpodoximum axetil-250 mg each 2 times a day; Cefpodoximum-100 mg 2 times a day; ceftibutenum or cefiximum-400 mg per day; -protected aminopenicillins: amoxicillin/clavulanic acid 500 mg/125 mg 3 times a day [3].

Discussion

Moreover, according to the WHO recommendations, on the outpatient stage, it is preferable to use drugs with a non-invasive administration route since parenteral forms reduce the level of compliance between doctor and patient and reduce treatment compliance in the latter [28]. This situation provokes the development of complications, process chronization and antibiotic resistance growth of pathogens. Also, the parenteral forms are

prescribed when it is impossible to take medications orally (nausea, vomiting), the so-called “switch” therapy: the initial parenteral administration of a drug with further change oral administration after improvement.

Fluoroquinolones (Levofloxacin) were prescribed in 12% of cases (Figure 4) with a dosage of 500 mg a day which corresponds to the literature data, but the therapy course duration is not indicated. Although the selected drugs for community-acquired uncomplicated pyelonephritis from the perspective of evidentiary medicine are fluoroquinolones: ciprofloxacin – 500 mg, 2 times a day; Levofloxacin – 500 mg, once a day; Norfloxacin – 400 mg, 2 times a day; Ofloxacin – 200-400 mg, 2 times a day during 10-14 days (1b level of evidence, recommendation grade B) [3].

In the majority of cases, the multiplicity of furazidine intake does not meet the recommendations based on drug pharmacodynamics [29], which indicates poor knowledge of the drug pharmacodynamics.

In treating acute cystitis, in most cases, alternative medications were prescribed, though according to current recommendations, first-line therapy includes fosfomycin trometamol, pivmecillins and nitrofurantoin macrocrystals, which according to the results of this study were not used at all. Co-trimoxazole is the dosage 160 / 800 mg, 2 times a day for 3 days or trimethoprim (TMP) 200 mg, 2 times a day for 5 days can be used as the first-line therapy in areas, where E. coli resistance < 20 % [3]. In 39% of cases, there were prescribed cephalosporins (ceftriaxone), fluoroquinolones (levofloxacin) - 34% and nitrofurans (furazidin)-27% (Figure 4). Alternative antibiotics are ciprofloxacin-250 mg, 2 times a day, ciprofloxacin with a prolonged action at the dose of 500 mg, 1 time a day, levofloxacin at the dose of 250 mg, 1 time a day, norfloxacin-400 mg, 2 times a day, each of the drugs taken a three-day course [3].

The same situation was observed when prescribing antibiotics for urethritis, preference was given to the second-line drugs, so fluoroquinolones (levofloxacin) were administered in 51% of cases, and the first-line drugs, namely cephalosporins, were prescribed only in 16% of cases (Figure 4). Moreover, the dosage regimen of antibacterial drugs, dosage frequency, treatment course did not meet current recommendations [3].

Documentation analysis has shown that the age-specific features of patients were not taken into account when prescribing antibiotics and selecting a dose, and in no case, the glomerular filtration rate was measured [29].

In conclusion, in most cases (71%), alternative antibacterial drugs were prescribed for initial treatment of urinary tract infections. In majority cases, the dosage regimen of antibacterial drugs, dosage frequency, treatment course did not meet current recommendations. Also, there were prescribed antibiotics with the parenteral administration route, although, according to the WHO recommendations, it is preferable to use drugs with a non-invasive administration route in the outpatient stage.

The results obtained from this PPS study, which was first conducted in municipal hospitals, reveal several specific opportunities for improving the practice of antibacterial drugs use, which may lead to improved treatment results of patient, resistance growth prevention and reduced health care costs.

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