

# ETHIOLOGICAL AND THERAPEUTICAL PARTICULARITIES OF URINARY INFECTIONS IN UROLOGICAL PATIENTS

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**Abstract:** *The aim of our retrospective study was to analyze in dynamics the etiologic spectrum of the urinary infections in patients hospitalized in the Urology ward of the Clinical County Emergency Hospital Braşov during 2011-2013. The levels of the antimicrobial resistance of the implicated germs was also evaluated. The main involved agent in both studied years was E. coli, followed by other Enterobacteriaceae (Klebsiella spp., Enterobacter spp., Proteus spp., Serratia spp., Citrobacter spp.), Enterococcus spp., Staphylococcus spp. and non-fermentative bacilli (Pseudomonas aeruginosa, Acinetobacter spp.). There were registered different levels of resistance to the tested antibiotics. We have observed an increase of the shares of Extended spectrum beta-lactamase producing strains and of the High - Level Aminoglycoside Resistance strains.*

**Key words:** *urinary infections, antimicrobial resistance, ESBLs.*

## 1. Introduction

In present it is considered that urinary tract infections are situated on the second place as frequency among acute human infections, after the upper respiratory tract infections. [5]

This pathology is extremely common in woman who, due to the anatomical reasons (shorter urethra), the sexual intercourses and the use of de contraceptive means, have a high risk to develop infections (lifetime risk greater than 50%) with recurrent episodes (20% of woman with a first urinary infection) [4], [5], [9], [11], [13], [18].

In men, urinary infections are not as frequent but in the absence of appropriate therapy can lead to life threatening events generated through septicemia, to acute local

complications or to evolution with recurrent episodes [5], [18].

The risk factors of urinary tract infections can be genetic predispositions, obstructions of urinary tract (stones, tumors, strictures, tumor of prostate), neurological disorders (Parkinson's disease, spinal cord injuries, multiple sclerosis, peripheral nerve damage), immune-suppressions, debilitating diseases (diabetes mellitus), urological (catheters, tubes) or contraceptive devices (spermicidal agents and diaphragms), deficitary personal hygiene, pregnancy, menopause etc [2], [3], [4], [5], [8], [10], [17], [18].

Several studies indicate *Escherichia coli* as being the main agent of urinary infections, implicated in 70-95% of urinary infections.

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The second uropathogenic species is considered to be *Klebsiella pneumoniae*.

There were also reported other Enterobacteriaceae (*Proteus*, *Enterobacter*, *Serratia*, *Citrobacter*, *Morganella*, *Salmonella*) as having significant frequencies followed by *Enterococcus* spp., *Staphylococcus*, *Pseudomonas aeruginosa*, *Acinetobacter* species [2], [3], [4], [5], [9], [11], [12], [15].

Urinary infections represent up to 40% of all the hospital-acquired infections. The antibiotherapy of hospital-acquired infections raise therapeutical problems due to the resistance to antibiotics, mainly for the ESBL (Extended Spectrum Beta-lactamase) and HLAR (High Level Aminoglycoside Resistance) strains [1], [6], [8], [14], [16].

## 2. Material and methods

The aim of our retrospective, descriptive study was to analyze the particularities of urinary tract infections in urological patients.

For this purpose, there has been analyzed the etiological spectrum of these infections as well as the levels and resistance patterns to antibiotics of the implicated germs.

There have been analysed 426 bacterial strains isolated through urine culture from the patients hospitalized in the Urology ward of the Clinical Emergency County Hospital of Braşov.

In order to determine the dynamics of isolated urinary pathogens implicated in the urinary infections in urological patients, the study has included two periods of 6 months (1.01.2011 -30.06.2011; 1.01.2013 - 30.06.2013).

For the identification of the gram negative germs, have been used biochemical tests (Triple Sugar Iron Agar, Urea Agar, S.I.M. Medium, Simmons Citrate Agar and Oxidase test).

For *Enterococcus* strains, was performed the bile-esculin test.

The coagulase test, AVIPATH STAPH latex agglutination, pigmentogenesis, beta -

hemolysis, were taken into consideration for the *Staphylococcus* strains.

Antibiogram was performed according to the C.L.S.I. (Clinical Laboratory Standard Institute).

The synergy test was used for the detection of the E.S.B.L. (Extended Spectrum Beta Lactamases) strains.

## 3. Results and discussions

We have initially analyzed the dynamics of the bacterial strains isolated from urine in patients hospitalized in the Urology ward of the County Clinical Emergency Hospital of Brasov during 6 months periods in 2011 and 2013.

The dynamics of the number of gram negative bacilli implicated in urinary tract infections is presented in Figure 1.

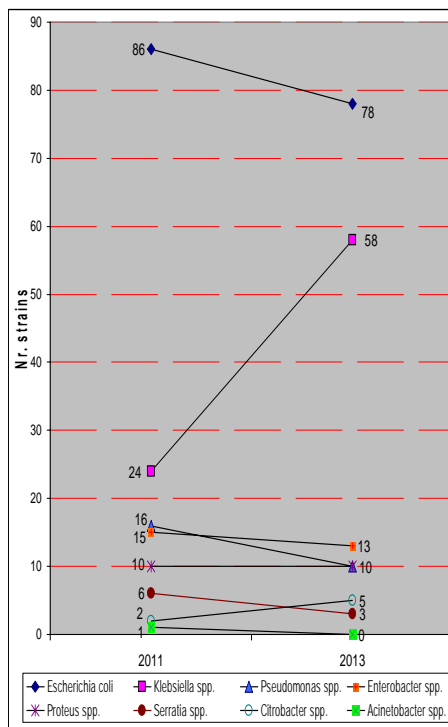


Fig.1. *The dynamics of the gram negative bacilli isolated from urine*

The dynamics of the number of gram positive cocci is shown in Figure 2.

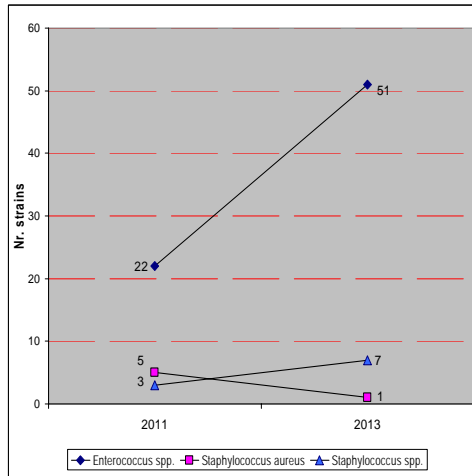


Fig. 2. The dynamics of gram positive cocci isolated from urine

years, excepting Acinetobacter spp. which was isolated only in 2011.

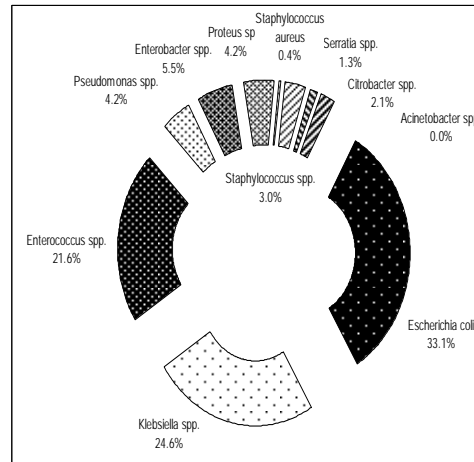


Fig. 4. The etiological spectrum of urinary infections between January and June 2013

The etiological spectrum of the urinary tract infections in the year 2011 and 2013 are illustrated in the Figure nr 3 and Figure nr 4 respectively.

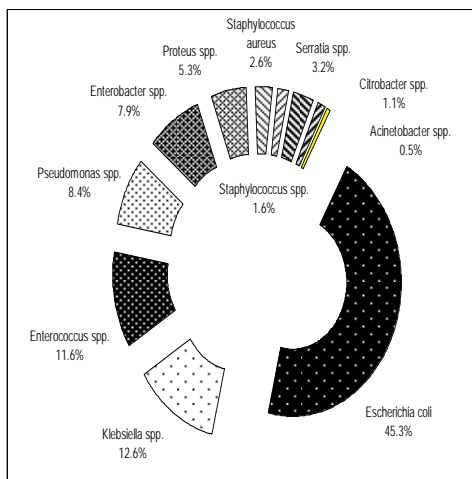


Fig. 3. The etiological spectrum of urinary infections between January and June 2011

The etiological spectrum of urinary tract infections was the same in both studied

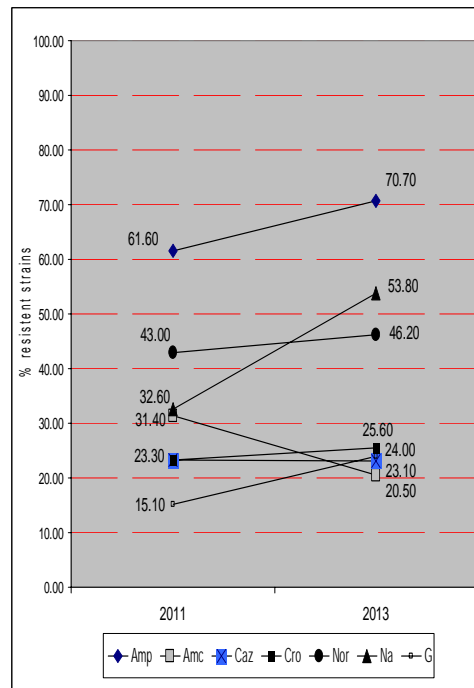


Fig. 5. Antibiotic resistance in urinary isolates of E. coli

For the isolated bacterial strains, various antibiotics were tested through difusimetric antibiogram: beta-lactams (penicillin – P; ampicillin – Amp; amoxicillin – clavulanic acid – Amc; ceftriaxone – Cro; ceftazidime – Caz; imipenem – Ipm), fluoroquinolones (nalidixic acid – Na; Norfloxacin – Nor; Levofloxacin - Lev), aminoglycosides (gentamicin – G; amikacin - Ak), glycopeptides (vancomycin, teicoplanin) and other antimicrobials (colistin; chloramphenicol).

The percentage of the resistant *E. coli*, *Klebsiella* and *Enterococcus* strains for each of the tested antibiotics is illustrated in Figures nr 5, number 6 and 7 respectively.

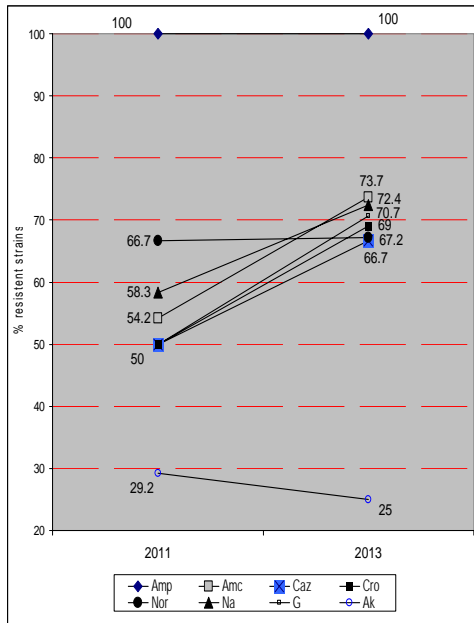


Fig. 6. Antibiotic resistance in urinary isolates of *Klebsiella* spp.

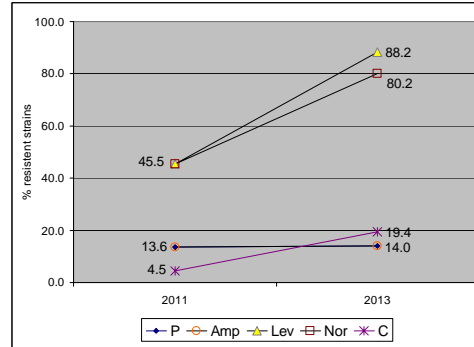


Fig. 7. Antibiotic resistance in urinary isolates of *Enterococcus* spp.

There were also analyzed the multiresistant bacterial strains isolated from urine samples.

The share of ESBLs was slightly higher in 2013 compared to 2011 as shown in the Figure 8.

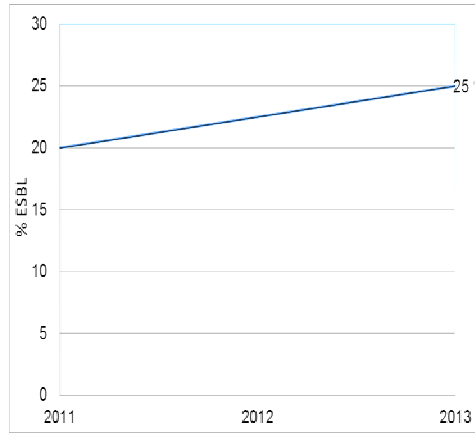


Fig. 8. Dynamics of ESBL strains

The ESBL strains detected in 2011 were 16 *Escherichia coli* (55%), 7 *Klebsiella* spp. (24%) and 6 *Enterobacter* spp. (21%).

We have also analyzed the share of HLAR *Enterococcus* strains for the studied years, as shown in Figure 9.

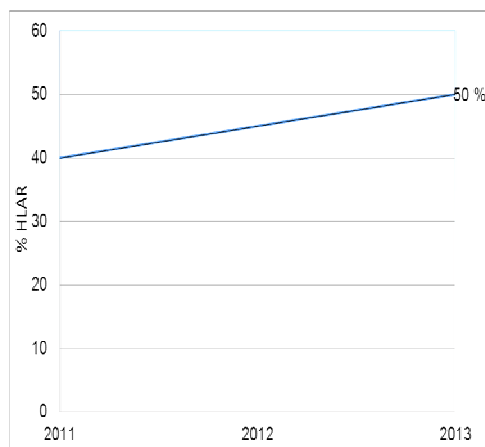


Fig. 9. Dynamics of HLAR strains

During the study, the number of isolated *Staphylococcus* species was low and the number of M.R.S.A. strains (Methicillin Resistant *Staphylococcus aureus*) was also small (2 strains in 2011 and 1 strains in 2013).

The analysis in dynamics (period of 2011 compared to 2013) of the urinary tract infections spectrum in patients hospitalized in the Urology ward indicates that the main etiological agent was *E. coli*, followed by *Klebsiella pneumoniae* and *Enterococcus* spp. The obtained results are similar with those of other studies that were carried out in the same medical units or published in the medical literature [2], [3], [4], [5], [7], [9], [11], [12], [15].

Although the etiologic spectrum was similar in the two years studied, the frequencies of *Klebsiella* and *Enterococcus* spp. strains have increased.

As in other studies, for *Enterobacteriaceae* there were obtained different shares of resistant strains to the tested antibiotics excepting imipenem and colistin for which all *Escherichia coli* and *Klebsiella* strains were susceptible.

All isolated *Enterococcus* species strains were sensitive to vancomycin, teicoplanin, linezolid but there were detected resistant

strains in case of penicillin, ampicillin, chloramphenicol, levofloxacin, norfloxacin.

The obtained results regarding the antimicrobial resistance are consistent with those of other published studies [1], [6], [7], [8], [14], [16].

#### 4. Conclusions

- The main etiological agent of the urinary tract infections in urological patient was *E. coli*, with lower frequencies being also isolated other *Enterobacteriaceae*, enterococci, staphylococci and non-fermentative gram negative bacilli (*Pseudomonas aeruginosa*, *Acinetobacter* spp.).
- The analysis in dynamics of the ethiological spectrum has included the same bacterial species but the number of *Klebsiella* strains and *Enterococcus* strains has increased.
- There was registered an increase of *E. coli* strains resistant to nalidixic acid, germtamicin and ampicillin.
- For *Klebsiella* spp. there was observed an increase of the number of resistant strains to the tested antibiotics excepting to amikacin and norfloxacin.
- In case of *Enterococcus* spp. we have found an increasing number of strains resistant to quinolones.

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