

## Etiology and resistance patterns of uropathogenic strains isolated from ambulatory urinary tract infections

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### ABSTRACT

Urinary tract infections (UTIs) have become a growing concern worldwide due to the increasing number of strains resistant to a wide array of antibiotics. The objective of this study was to determine the etiology and resistance patterns to antibiotics of bacteria isolated from UTIs. The study was conducted between January 2012 and December 2013 on a number of 6346 samples isolated from patients diagnosed in the CMIML Dr. Stoica Florisanda laboratory. The isolated strains were identified using biochemical conventional tests and Vitek system, and the antibiotic susceptibility was realized by disk-diffusion method. The prevalence of urinary tract infections was 16.42%, with a higher incidence in women of 82.15% in contrast to men. Member of *Enterobacteriaceae* family (93.85%) had the highest isolation rate. The study of the resistance patterns showed that 60.26% of the tested strains were resistant to one or more antibiotics.

**Keywords:** resistance patterns, uropathogenic strains, urinary tract infections.

### 1. INTRODUCTION

Urinary tract infections have become a growing concern worldwide [1, 2] and the most common bacterial infection encountered in the ambulatory care setting accounting for 8.6 million cases of which 84% are women in the US only [3].

Urinary tract infections develop when bacterial pathogens that have adhered to the periurethral area ascend to the bladder [4, 5]. The pathogens can spread up the urinary tract to the kidneys [6, 7]. *E. coli* is the most frequent bacterial pathogen, causing 75-90% of UTIs [8, 9, 10, 11]. Urinary infections are classified by: the location of the infection, symptoms, recurrence, evolution, age and

individual characteristics of the patients [12, 13; 14, 15]. An effective treatment of urinary tract infections is difficult to develop due to the emergence of multidrug resistant strains [16, 17]. The resistance phenomenon is influenced by the horizontal transfer of resistance genes between microorganisms [18].

The objective of this study was to determine the etiology and antibiotic resistance patterns of the strains isolated from ambulatory patients diagnosed in the CMIML Dr. Stoica Florisanda laboratory.

### 2. EXPERIMENTAL SECTION

The study was conducted between January 2012 and December 2013 on a number of 6346 samples isolated from patients with different ages. Two thirds of the urine samples analyzed were obtained from women (4597).

The samples were seeded on the MacConkey Agar medium, a specific *Enterococcus* medium and on CLED Agar medium in order to isolate a wider array of bacteria ranging from Gram-negative rods to Gram-positive cocci.

The identification of the strains was based on conventional tests (coagulase test, catalase test, streptococcal grouping kits, oxidase test and biochemical tests), an enriched medium (*ChromAgar Orientation*) and the Vitek 2 Compact analyzer. The VITEK 2 system uses a bacterial database containing specific biochemical information. The identification card used contains

tests based on the activity of metabolic enzymes, determining the specific biochemical traits of the bacteria. The bacteria are identified in 2 to 12 hours depending on the microorganism.

The antibiotic susceptibility of the studied strains was established by the disk-diffusion method (Kirby -Bauer), following the indications of the 2014 edition of the CLSI guide. The antibiotics tested included: amoxicilin plus clavulanic acid (AMC), cefuroxime (CXM), ceftazidime (CAZ) or cefotaxime (CTX), ciprofloxacin (CIP), norfloxacin (NOR), nitrofurantoin (F), gentamicin (CN) and sulfamethoxazol-trimethoprim (SXT). The reference strains used to determine the accuracy of the measurements were *E. coli* (ATCC 25922), *P. aeruginosa* (ATCC 27853) and *S. aureus* (ATCC 25923)

### 3. RESULTS SECTION

The prevalence of urinary tract infections was 16.42%, with a higher incidence in women (82.15%) comparing to men

(17.85%). The most cases were found at the age group of 20-45 (Fig. 1). Other studies on the incidence of UTIs in regard to sex

patients demonstrated that women are significantly more likely to experience UTIs than men. Almost half of all women will experience at least 1 urinary infection thought their life, with a higher predisposition to complications than men. Children and infants are regarded as the most susceptible to contracting these infections [15].

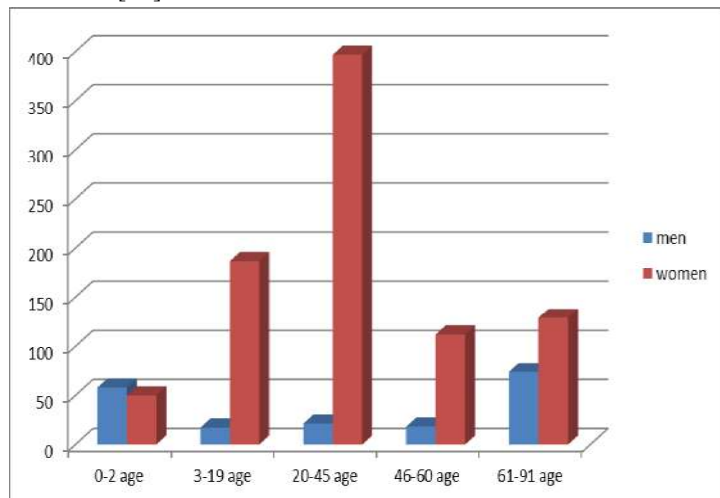


Figure 1. The prevalence of urinary tract infections regarding sex and age group.

The results showed that the strains with the highest isolation rate belonged to the *Enterobacteriaceae* family (93.85%), and among these *E. coli* was most commonly isolated (70.63%) (Fig. 2).

The study of the resistance patterns showed that 60.26% of the isolates were resistant to one or more antibiotics, the 61-91 age group having the highest resistance rate. The highest rate was observed for ampicillin (41,68%), sulfamethoxazol-trimethoprim (38.86%), followed by norfloxacin (17.94%) and ciprofloxacin (16.41%) (Fig. 3).

These results are in concordance with other studies, for example, the ARESC study conducted in 9 countries as well as other studies confirming that *E. coli* is the most common uropathogen accounting for 76.7% of cases. This study also

#### 4. CONCLUSIONS

Urinary tract infections (UTIs) are the most common bacterial infections in clinical medicine. The obtained results confirmed data from the literature regarding the higher incidence of UTIs in women in comparison to men. Taking into consideration the age factor, the elderly persons are most susceptible to urinary infections caused by multidrug resistant bacteria. An increasing resistance to antibiotics was seen, highlighting the necessity of novel effective antibiotic treatments for UTIs.

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showed that in 17.5% of cases *E. coli* was resistant to sulfamethoxazol-trimethoprim [19, 20].

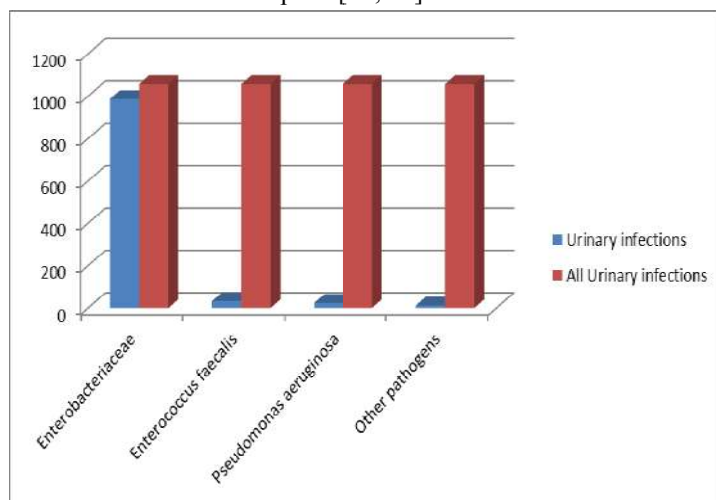


Figure 2. Prevalence of bacterial pathogens in urinary tract infections.

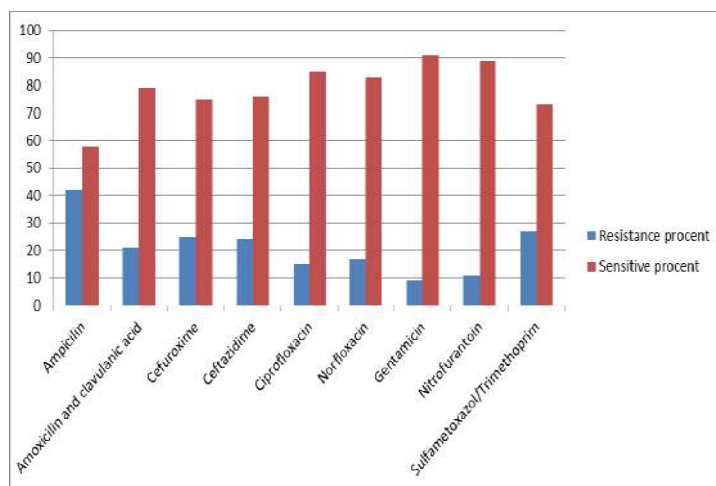


Figure 3. Graphic representation of antibiotic resistance patterns.

An important factor that appears to be a major cause of the exacerbation of the resistance phenomenon, which remains to be studied in future papers is the influence of the horizontal transfer of resistance genes between microorganisms through mobile genetic elements. Because the epidemiology and resistance to antibiotics varies from one geographical region to another, such studies of antibiotic resistance patterns centered on uropathogens isolated in Romania are useful both for clinicians and epidemiologists.

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