

## Etiology and Antimicrobial Sensitivity Profile of the Microorganism Associated With Urinary Tract Infections

Liana de Almeida Reis<sup>1</sup>, Líliann Evêncio Moura Luz<sup>2</sup>, Esmeralda Maria Lustosa Barros<sup>3</sup>, Kellyanne Soares de Sousa<sup>4</sup>, Filipe de Alcântara Lima<sup>5</sup>,  
Maria do Rosário Conceição Moura Nunes<sup>6</sup>  
<sup>1,3,5,6</sup>(Universidade Federal do Piauí, Brazil)  
<sup>4,2</sup>(Faculdade Integral Diferencial Facid | DeVry, Brazil)

**Abstract:** This study proposes to meet the most common aetiologic agents in urinary tract infection and the antimicrobial susceptibility pattern. We analyzed all bacteriological examinations of urine recorded in Central Laboratory do Piauí-LACEN situated in the municipality of Teresina-PI of patients seen in December 2013 period through April 2014. It was observed that were filed during the designated period urine, 1647. Of these, 109 were positive cultural examination. *Escherichia coli* was the most isolated microorganism (71.6%), followed by the genus *Klebsiella* (14.7%), by *Pseudomonas aeruginosa* (2.8) and *Proteus mirabilis* (1.8%). In relation to antimicrobial susceptibility, *Escherichia coli* and *Klebsiella spp* feature high resistance to antimicrobials Amoxicillin, Piperacilina, Cephalotin, Cefazidime and Quinolones. To the Enterobacteria in study, Imipeneme, Netilmicin and Amikacin were the antimicrobials with higher degree of susceptibility. In respect of *Pseudomonas aeruginosa* isolates, antimicrobials were more effective, the Imipeneme and Amikacin. In this way, the need to periodically reviews the ITU for being a promising environment for bacterial infection and to understand the evolution of antimicrobial susceptibilities, for part of the main etiological agents, over time.

**Keywords:** Etiological Agents, Urinary Infection, Microorganism.

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### I. Introduction

The urinary system is composed of upper urinary tract (kidneys, renal pelvis and ureters) and lower urinary tract (urethra and bladder), which together form and expel urine. The kidneys are located in the lumbar region, on both sides of the spine. In them occurs in the production of urine, from waste removed from the blood as it circulates through the kidneys. The urinary tract is an anatomical site, with the exception of sterile urethral meatus and distal urethra, regions colonized mainly by *Staphylococcus*, difteroides and other diners (1). Thus, urinary tract infection (UTI) is a general term that indicates invasion of the urinary system, previously barren, by bacterium. Some authors also called UTI infections by fungi or viruses (2). Urinary tract infections can be classified as low (cystitis), where there is no kidney problems and, as high (pyelonephritis), renal involvement, these being, according to the evolution of painting, called acute and chronic, complicated or not complicated (1). Urinary tract infection is characterized by the bacterial growth of at least 100,000 colony leaders units per milliliter (cfu/mL) (3). The diagnosis of urinary tract infections is always done in clinical and laboratory bases (4). The most suitable tests for confirmation of this infection are: urinary sediment, reagent, urine culture, biochemical tests or additional testing antimicrobial susceptibility test – TSA and Imaging tests (2). The urine culture is the examination considered "gold standard" in the laboratory diagnosis of uti, being considered a complementary analysis widely used because it allows the growth of isolated Etiologic Agent, allowing sequentially perform the test of susceptibility to antimicrobials (5). The effectiveness of the examination can be performed from the midstream urine specimens, urethral catheter and suprapubic puncture, being more used the midstream urine sample, collected aseptically (6).

The most common microorganisms in urinary tract infections are the gram-negative bacilli, participating in about 90% of the reported cases, 6% of cases are caused by Gram-positive coccus, and around 2% to 3% by yeasts, viruses, protozoa and parasites. Among the gram-negative bacilli, *E. coli* affects about 70% of the 90% of the cases. *Staphylococcus saprophyticus* is the second species most isolated, responsible for 10% to 20% of these infections. Other bacterium that may be involved in UTI's are *Staphylococcus aureus*, Group B *Streptococcus* and *Enterococcus faecalis* D, *Klebsiella pneumoniae*, *Enterobacter spp.*, *Proteus spp.*, *Pseudomonas spp.*, among others (1). This pathology affects men and women of various ages, but the groups most often affected are male newborns, men with prostatic obstruction, the elderly of both sexes and in particular young women sexually active (7).

Urinary tract infections are very frequent cause of morbidity, and in certain situations may lead to significant mortality (4). According to epidemiological data, worldwide, about 150 million people are diagnosed with UTI per year. In Brazil the UTI's are considered the most common bacterial infections, responsible for 80 in every 1,000 clinical consultations (8). However, the actual incidence of UTI is probably underestimated, because at least half of all urinary tract infections resolve without medical attention (9).

The occurrence of the causative pathogen of ITU varies geographically and the susceptibility profile requires monitoring to provide information to new guidelines of therapeutic options. One of the main concerns regarding the use of drugs is related to the use of antimicrobials. The increase in bacterial resistance to several antimicrobial agents entails difficulties in controlling infections and contributes to the rising costs of the health system and their own hospitals (9).

In view of the serious problems related to ITU diseases, it is proposed to perform this study, investigational character, in order to obtain data on the incidence of urinary tract infectious agents and thus contribute to epidemiological studies.

From this, the research has as problematic the etiology of the major infectious agents related to ITU, which compromised patients who performed the examination of urine culture in the period of December 2013 to April 2014 on Central Laboratory do Piauí-LACEN situated in the municipality of Teresina-PI. How chance the UTI is the second most common infection in the general population, occurring in all age groups, from newborn to elderly. The pattern of infection differs between men and women. In men, the ITU's are more frequent in the extreme ages (infants and elderly), while in women occurs a gradual rise over the years (2).

## **II. Aims & Objectives**

Thus, the present work aims at evaluating the General frequency of major urinary tract infectious agents that compromised patients who performed the examination of urine culture in the period of December 2013 to April 2014 on Central Laboratory do Piauí-LACEN situated in the municipality of Teresina-PI. The specific objectives were: to verify the prevalence of bacterial strains associated with paintings of urinary tract infection in patients who performed urine culture; the epidemiological profile of these patients, regarding gender, age; correlate the results with the literature and profile of antimicrobial sensitivity of microorganisms associated with urinary tract infection.

## **III. Material And Methods**

We conducted a retrospective study of all positive urine (from 100000 cfu/ml) of patients seen in December 2013 period to April 2014 at the Central Laboratory of Piauí-LACEN situated in the municipality of Teresina – PI. The urine were sown with calibrated handle (1:1000) CLED agar (lactose electrolyte deficient cystine) and MacConkey agar after homogenization of urine. The plates were incubated at 35° C the bacteriological oven ( $\pm 1^\circ$  C) for 18 to 24 hours. After incubation, identification of the micro-organism was made by appropriate biochemical tests and later held the antibiograms through the disk diffusion technique Müeller-Hinton agar.

For determining bacterial sensitivity took into consideration the halo diameter produced by bacteria in the disc-diffusion. Subsequently, the results of antibiogram were transferred on the books of record of the microbiology laboratory, where these data were collected.

### **III.1 Ethical Aspects**

The survey was conducted according to Resolution 196/96 of the National Health Council (CNS), which deals with the guidelines and regulatory norms for Research Involving humans. The study was submitted to the evaluation of both the Committee of ethics in research (CEP) under the number: 18308113.3.0000.5211 Integral Differential College – FACID/DeVry, through the submission of the project via Brazil, Platform as the General and technical direction of the laboratory for the research LACEN was held in the same and for that if I could have access to the data. Data collection was started after approval by CEP. All the information has been kept under wraps through the anonymity of the subjects of the research since the data collected did not identify the patients.

## **IV. Results And Discussion**

We conducted a retrospective study where in the study period were performed 1647 urine. Used as inclusion criteria for "positive" bacterial growth on MacConkey agar plates and Cled equal to or greater than 100,000 cfu/ml. Of these 1538 (93.4%) were negative for isolation of microorganisms. It was observed a larger number of urinary tract infections in women (77.8%) than in men (22.2%).

In all of the positive urine, 81 (74.3%) samples were from females and 28 (25.7%) samples of males. Bacteriological examinations, 12 different agents have been identified, being the *Escherichia coli* the most frequently isolated organism (71.6%), followed by the genus *Klebsiella spp.* (14.7%), *Pseudomonas*

*aeruginosa*(2.8%) and *S. saprophyticus* (1.8%). Other species have been found in 0.9% of the samples with positive cultural examination.

The results of the positive urine prevailed between the ages of 21-30 years old female and the range of 41-50 showed a higher number of positive male urine. Positive cultures for *E. coli* showed a low susceptibility to quinolone antibiotics (Nalidixic Acid, Norfloxacin and Ciprofloxacin) (51%), the Piperacilina (61.2%), (59%), Cephalotin Cefotaxime (58.3%) and to amoxicillin (53%). Of the antimicrobials tested for *E. coli*, those who had higher action and were the Imipenem (96%), Cefotaxime (95%), amikacin (92%), Nitrofurantoin (98.2%) and Netilmicin (91%).

As for *Pseudomonas aeruginosa*, the antimicrobials tested, this got a high percentage of Imipenem susceptibility (83.2%). As regards the remaining antimicrobial susceptibility or is greatly reduced or intermediary. The genus *Klebsiella* was sensitive to Imipenem (98%) and Amikacin (85%). This led to extremely low susceptibilities to antimicrobials Amoxicillin, Piperacilina and Cephalothin.

The ITU is the second most common infection in the community, behind only of respiratory infections. This situation affects persons of infectious both sexes and of all ages, however, young women make up the main group (11) as demonstrated in our study where the results of positive urine, prevailed in the age group of 21 to 30 years old female and the range of 41-50 showed a higher number of positive male urine. The percentage of negative samples is very high (93.3%), probably due to the large amount of urine, which take place with patients already begin empirical treatment, aftercare and control in pregnant women, as well as the large number of urethral syndromes that may include a non-bacterial aetiology (12).

The percentage distribution of micro-organisms obtained in this study presents some similarity to the registered by other authors, i.e., *E. coli* is the most frequently isolated organism, followed by other members of the family Enterobacteriaceae. In relation to *Pseudomonas aeruginosa*, although this only have been isolated only in 2.8%, your importance should not be disregarded, since several authors have referred to as an emerging protagonist of Uti (12) (13).

Is of fundamental importance for the development of studies that seek to meet the regional prevalence of uropathogens, as well as your antimicrobial resistance profile. The knowledge of such data enables the medical community to choose, among the various treatment alternatives, the most suitable Antimicrobials for the empirical treatment. This information gives greater support to the clinician, so that you can decide more securely appropriate antimicrobial therapy.

The set of antimicrobials used in antibiograms, which showed lower action front of *E. coli* were: amoxicillin, piperacilina, cephalotin, ceftazidime, nalidixic acid, norfloxacin and ciprofloxacin. The action of drugs in the penicillin group of drugs in front of *E. coli* may be related to the high prevalence of  $\beta$ -lactamases, which discourages the your use when not associated with an inhibitor of these enzymes, such as amoxicillin-clavulanic acid.

To antimicrobials belonging to the quinolone antibiotics (Nalidixic Acid, Norfloxacin and Ciprofloxacin) was observed a low proportion of susceptibility by the *E. coli*, *Klebsiella* gender, *Proteus mirabilis*. This low susceptibility can assign to your massive and uncontrolled use in clinical and veterinary practice since your commercial introduction, evidenced by a 2001 study, where Portugal was the European country with the highest rate of use of antimicrobials (14) (18). Given the high resistance of these microorganisms to Quinolones, both in hospitals and in the community, these should not be used as first-line Antimicrobials for the treatment of Uti (12) (14).

Imipenem and Amikacin showed great activity in front of these three microorganisms. By this fact, are antimicrobial agents that can be used in the empirical treatment of uti, since you should use in these circumstances an antimicrobial with a susceptibility that should hover at least 80 to 90% (14). The *E. coli* showed a high susceptibility to Nitrofurantoin. Despite this high susceptibility, we should take into account that this requires prolonged treatment antimicrobial, four times a day, for at least seven days, and that along with your toxicity, makes it necessary to carefully evaluate the your use in the treatment of community infections (12). In *Pseudomonas aeruginosa* isolates, antimicrobials most active were the Imipeneme, the Meropeneme and amikacin. However, these percentages, in particular those related to the Meropeneme, are low. Produce betalactamases, along with the loss of specific purines Carbapenems, may be a mechanism involved in resistance to these, from *Pseudomonas aeruginosa* (11).

## V. Conclusion

It is understood, for this work, which should be carried out periodic evaluations because the urinary tract is a promising environment for bacterial infection is very common in any age group, being your treatment, most of the time, and even completed of empirical way. On this, there is a need for greater knowledge of the prevalence and frequency of infectious agents; seeking a treatment to ensure a resolution of most urinary tract infections and reduce the appearance of new bacterial resistance. It is important to conduct studies covering as many years as possible, in order to be able to study the evolution of antimicrobial susceptibilities, for part of the

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