



Urinary infection – Diagnosis, treatment and aggravation by the gram-negative bacteria *klebsiella*

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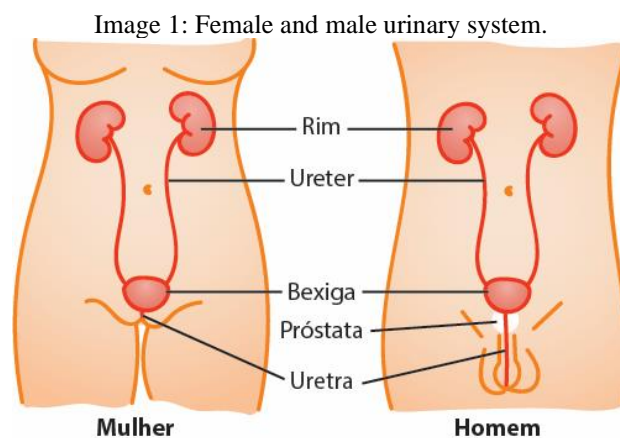
ABSTRACT

Urinary Tract Infections (UTIs) are very common among hospital diagnoses, varying greatly in severity depending on the type of host microorganism, bacterial resistance to antibiotics and the location in which the patient is located. The forms of treatment, diagnosis and prevention also vary depending on the microorganism. In addition to caring for patients in relation to prevention, it is necessary for healthcare professionals to be aware when handling their tools, clothing and administering medication, as well as for the hospital to follow the hospital infection control law. The objective of this work is a review of urinary tract infections, covering their causes, diagnosis, treatment and prevention.

Keywords: Urinary Tract Infection, Microorganisms, Klebsiella, Antibiotics, Symptoms, Hospital.

1 INTRODUCTION

The urinary system of human beings is considered the same in both men and women, with the difference only being the size of the urethra, and both are divided into upper and lower. In the first case, it consists of the kidneys and ureters. The lower part is composed of the bladder and urethra (SANTOS, A.C. E., 2021).



Source: increasing.com.br/2020



Popularly known as urinary tract infections, urinary tract infection (UTI) is one of the pathologies that most affect patients inside and outside hospitals, as well as people over 40 years of age, especially women (NISHIURA J.L. *et al*, 2009).

Among the main factors identified in this infection are related to genetic, hormonal and behavioral factors, along with the virulence of the invading microorganism (NISHIURA, J.L. *et al*, 2009).

Cases of UTIs are more apparent in women because their urethra is less than 5 centimeters long, allowing microorganisms to cross it more easily. In addition, the location of the vaginal vestibule is closer to the anus, facilitating the contamination process (OLIVEIRA A.L.D, 2014).

Still in the pediatric phase, male children are more susceptible to UTI between the first three months of life, and after this period, they become females. It is estimated that at least 8% of girls and 2% of boys will have a UTI episode during childhood (Koch, V. H.; Zuccolotto S.M.C., 2003).

In childhood and preschool, girls are affected by UTI between 10 and 20 times more often than boys. In adulthood, the incidence of infection increases for females, maintaining them as predominant, with peaks of greater involvement at the beginning or related to sexual activity. It is estimated that 48% of women have at least one episode of UTI in their lifetime (OLIVEIRA A.L.D, 2014).

Urinary tract infections are characterized by an infectious condition caused by microorganisms, most commonly gram-negative bacteria, which can occur anywhere in the urinary system, and has presented, over the years, more and more cases of resistance to antibiotics in their treatment, especially in the case of the uropathogens *Escherichia coli*, *Klebsiella* and *Proteus* (OLIVEIRA A.L.D, 2014).

Antibiotic resistance can be caused by a variety of circumstances, which can vary according to the pathogen or even the patient's own drug history. If it is natural resistance, it means that the microorganism of a certain species is already resistant to the antibiotic for physiological reasons. It can be acquired (through the recurrent use of antibiotics, for example), or some microorganisms of the same species are sensitive and others resistant (SANTOS, A.C. E., 2021).

This resistance is provoked when a colony of bacteria is given an antibiotic, which fights only part of them. Those that remain alive begin to undergo gene mutations and become increasingly resistant to medication, even if at higher dosages (AGUIAR, P.P., 2020).

Among the main factors associated with this pathology are sexual intercourse, the use of certain spermicidal jellies, pregnancy and the number of pregnancies, diabetes (only in females) and poor hygiene (more common in patients who are in unfavorable socioeconomic conditions, as well as in obese patients), invasive manipulation of medication (assisted ventilation tubes, catheters or bladder tubes), aggressive antimicrobial therapy that eliminates commensal flora, failure of the immunization system, advanced age, and premature birth (OLIVEIRA A.L.D, 2014).



Pathogenic bacteria are characterized by their ability to transmit, adhere, invade, and colonize host cells and tissues. Commonly, inflammations begin to occur in the urethra or urethritis, proliferating to the bladder (causing cystitis), or even to the kidneys (pyelonephritis), thus being divided into two ways: upper and lower. Upper UTIs include pyelonephritis and ureteritis. Lower UTIs include cystitis and urethritis (OLIVEIRA A.L.D, 2014).

On a general spectrum, while 90% of UTI patients manifest cystitis, only 10% develop pyelonephritis. Infections are sporadic in approximately 75% of patients and recurrent in 25% (OLIVEIRA A.L.D, 2014).

Urinary tract infections are classified as uncomplicated when they occur in patients with normal urinary tract structure and function and are acquired outside the hospital environment (OLIVEIRA A.L.D, 2014).

However, those acquired in the hospital environment are considered more severe, and the highest incidence occurs due to *Klebsiella*, *Enterobacter* and *Serratia*, presenting as pneumonia, cystitis or pyelonephritis and may progress to lung abscess, empyema, bacteremia and sepsis (BUSH L.M.; PERTEJO M.T.V., 2022).

In the case of *Klebsiella* pneumonia, a rare and serious disease, presenting with dark brown or jelly-red sputum, lung abscess formation and empyema, it is more common among diabetics and alcoholics (BUSH L.M.; PERTEJO M.T.V., 2022).

Symptoms vary between patients' age groups. While in children low back pain is the most common, in adults they may present dysuria, urinary frequency or increased urinary frequency, this urgency being voiding with pain under the abdomen, abdominal pain, chills and chills, general malaise and a lot of indisposition. In the elderly, behavior disorder in UTI is still common (SANTOS, A.C. E. et al, 2021).

2 PRESENCE OF *KLEBSIELLA* IN HOSPITAL SETTINGS

Hospitals, despite apparently being clean, are one of the environments with the highest rates of contamination because they serve sick people and are highly likely to contain a wide and varied range of microorganisms (DE FREITAS, C. G. S. et al, 2020).

Healthcare-Associated Infections (HAIs) are contaminations acquired within the hospital environment, during an outpatient procedure or by prolonged hospitalization, and may manifest during or after discharge (RIOS, L. L. et al, 2020).

HAI have enormous relevance for public health, due to the fact that immunocompromised individuals associated with the emergence of antimicrobial resistance are increasingly frequent in the hospital environment, which facilitates this type of infection (BASTOS, I. D.M. et al, 2020).



Among the various factors that can contribute to the transmission and proliferation of these pathogens, colonized and/or infected patients, contamination of professionals' hands, equipment and inanimate surfaces close to the patient that are touched by the hands of professionals and are potential reservoirs of microorganisms, among others (DE FREITAS, C. G. S. et al, 2020).

Another major source of contamination and proliferation within hospitals is in the clothing of health professionals, with the places of greatest contamination being bags, wrists, and the waist region, as they are areas of greater contact with surfaces and patients (RIOS, L. L. et al, 2020).

The lab coat (also known as aprons) is a mandatory garment in hospital care, precisely to help prevent contamination to the health professional. However, its use outside the hospital environment can cause serious risks to patients who will have contact the next day, as well as to their families, through proliferation and contamination (RIOS, L. L. et al, 2020).

Klebsiella is a gram-negative bacterium that has high rates of antibiotic resistance, and is associated with high rates of morbidity and mortality within hospital settings (AGUIAR, P. P., 2020).

This resistance to antimicrobials is such a serious issue that it has been discussed and controversial all over the world in recent years, since it is something very aggravating due to the fact that these microorganisms are in several places inhabited by humans, added to the irrational and indiscriminate use of medicines, hindering precise pharmacotherapy with antibiotics that are available on the market (AGUIAR, P. P., 2020).

This aggravating factor also extends to hospital environments, with the highest rates of finding *Klebsiella*, especially in ICUs, making it even more difficult to reduce mortality and contamination within hospitals. The main reason for its occurrence in environments like this is due to the fact that infection by multidrug-resistant bacteria is facilitated by the various ports of entry into the body, such as indwelling bladder catheters, central venous catheters, orotracheal tubes, tracheostomy cannulas and, in some cases, decubitus wounds (AGUIAR, P. P., 2020).

However, it is not only bacterial resistance that is a concern, but also the great consequences that it brings, such as the reduction in the possibilities of treatment and the decrease in the alternatives of drugs that could be used to carry out the therapy (AGUIAR, P. P., 2020).

Law No. 9,431/97 requires hospitals to maintain a Hospital Infection Control Program (HICP) in order to minimize or even extinguish these proliferations and also infections caused by microorganisms (DE FREITAS, C. G. S. et al, 2020).

3 DIAGNÒSTICO LABORATORIAL

The diagnosis can be made in several ways, in addition to the possibility of performing tests for rebuttal, which will bring a more accurate and assertive diagnosis.



The steps vary, starting with the physical and chemical analysis of the sample, with microscopic observation and urine culture, followed by antibiotic susceptibility testing (known as TSA, or antibiogram). The appearance of the urine is also very important and should be evaluated and described in a report: if it presents a cloudy aspect (presence of pyuria), and/or reddish (presence of blood) that can occur due to the inflammatory process (SANTOS, A.C. E. et al, 2021).

Urinary tract infection is identified through laboratory testing, which points to bacterial growth in the urine. This growth is at least 10⁵ colony-forming units per ml of urine (100,000 cfu/ml) in average jao in an aseptic manner (SANTOS, A.C. E. et al, 2021).

In some cases, usually in more aggravated states, or in elderly patients, bacterial growth equal to or greater than 10⁴ colonies (10,000 cfu/ml) (SANTOS, A.C. E. et al, 2021).

The test consists first of all in the qualitative evaluation of the test strips, followed by the quantitative analysis, which evaluates the urine sediment by means of microscopy. Another commonly used test is urine culture, which in most cases provides the etiological agent that causes the infection. After this test, the antibiogram is performed, which acts as a complement to urine culture, providing the potentially useful antimicrobials to be prescribed (OLIVEIRA A.L.D, 2014).

In more severe cases, it is also common to use imaging tests, such as ultrasound, which identifies the presence of stones associated with UTI. Sequentially, urography is performed (in cases that are not yet acute). Other tests that can be done, but which will depend on the age and worsening of the patient's clinical condition are: voiding cystourethrogram (indicated for children under two years of age, with recurrent UTI) (OLIVEIRA A.L.D, 2014).

4 TREATMENT

Although it is an apparently common infection, it is important to remember that it can be less aggressive, but with a high chance of evolving into a condition considered aggravating for the health and homeostasis of the human body.

In any case, it is important to have an early diagnosis for the eradication of the infectious agent in order to prevent morbidities resulting from the formation of lesions in the renal parenchyma that in the long term can form scars with the potential to cause hypertension and chronic renal failure (AZEVEDO, F. H. C. et al, 2021).

After the diagnosis of UTI, it is necessary to have full knowledge of the place where the bacteria is found, as well as the type of bacteria in question, in order to have an adequate treatment, which brings promising results in the patient's recovery, and that avoids bacterial resistance due to poor or incorrect drug administration.



Usually, treatment is with third-generation cephalosporins (cefepime, carbapenems, fluoroquinolones, piperacillin/tazobactam or aminoglycosides), but because there may be bacterial resistance to antibiotics, it is interesting to study the susceptibility (BUSH L.M.; PERTEJO M.T.V., 2022).

Klebsiella strains that produce broad-spectrum beta-lactamase (ESBL) may develop resistance to cephalosporins during treatment, and are inhibited to some extent by beta-lactamase inhibitors (BUSH L.M.; PERTEJO M.T.V., 2022).

When there are still the first diagnoses of UTI whose infection does not come from hospital environments, treatment can also occur with sulfonamides, which act by inhibiting the synthesis of nucleic acids, preventing bacterial multiplication (OLIVEIRA A.L.D, 2014).

In uncomplicated crises, quinolones can be prescribed, as their mode of action involves the inhibition of bacterial DNA synthesis by blocking DNA-gyrase, thus inhibiting the resistance mechanisms of bacteria (OLIVEIRA A.L.D, 2014).

Studies show that beta-lactam antibiotics tend to be less effective and so should not be used as the drugs of choice in the treatment of cystitis. The use of amoxicillin with clavulanic acid is recommended only if the antibiotics of first choice are not available or if their use is contraindicated (OLIVEIRA A.L.D, 2014).

5 CONCLUSION

Because it is a very common diagnosis, many people do not give due importance or even worry about the severity that urinary tract infections can take, often postponing a correct treatment for this pathology due to the presence of symptoms that can sometimes be milder.

As described in the course of this study, UTI may be more moderate, and may evolve to more severe cases when not treated or with late diagnosis, or even with symptoms and symptoms evolved from the beginning, which will depend on the host microorganism.

Regardless of the form, it is extremely important that the patient has knowledge and self-care, identifying any abnormalities in their clinical condition, should immediately seek professional help so that an accurate diagnosis and appropriate treatment are possible, avoiding clinical worsening or even genetic mutations in the microorganism due to possible bacterial resistance.



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