Albanian j. agric. sci. 2013;12 (3): 441-444 *Agricultural University of Tirana*

RESEARCH ARTICLE (Open Access)

The study of infectious agents of the urinary tract infections in Durrës, Albania

AURORA BAKAJ (ÇIZMJA)[1], ENTELA RUÇI (KULLA)[2], MIRELA LIKA (ÇEKANI)[3]

[1]University Colleges Medicom, Vlorë

[2]Regional Department of Public Health, Durrës

[3]Department of Biology, University of Tirana, Faculty of Natural Sciences, Boulevard Zog I, Albania

Abstract:

Urinary tract infections (UTI) are characterized by the presence of infectious agents in the genital-urinary tract that cannot be explained by contamination. These agents have the potential to invade the tissues of the urinary tract and adjacent structures. *Settings and Design*: Prospective study was done in the Health Directory in Durrës. *Methods and Material*: The study included all the patients who were admitted or visited the outpatient departments in the Health Directory and had urinary tract infection confirmed by positive urine culture reports. *Results*: A total 3160 urine samples were analyzed for isolation and identification of bacterial isolates. Out of which 956 (30.25%) samples were found to have significant bacteriuria and remaining 2204 samples were found to have either non significant bacteriuria or very low bacterial count or sterile urine. In the present study, out of 223 isolated pathogens the most common isolate was *Escherichia coli* (25.89%), followed by *Staphylococcus aureus* (2.94%), *Proteus vulgaris* (1.04%) and *Pseudomonas aeruginosa* (0.38 %). Age group most affected by *Escherichia coli* is 61-75 years (38.8%). *Conclusions*: Women are more susceptible to urinary tract infections, especially against *Escherichia coli*, resulting positive in 52.4% of cases; while *Proteus vulgaris* have a female percentage of 57.7%. This percentage increased slightly among women infected with Staphylococcus saprophyticus in 58% and low in 61.5% infected with *Pseudomonas aeruginosa*.

Keywords: Escherichia coli, Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa

1. Introduction

Urine is usually a sterile fluid, but when it is infected, it contains bacteria. Urinary tract infections (UTI) are one of the most common types of bacterial infections in humans occurring both in the community and the health care settings and ranks high amongst the most common reasons that compel an individual to seek medical attention [3,5,8,9].

UTIs are characterized by the presence of infectious agents in the genital-urinary tract that cannot be explained by contamination. These agents have the potential to invade the tissues of the urinary tract and adjacent structures. The microbiological profile is well known and pathogens such as *Escherichia coli* have been present in the vast majority of cases [2,6,10,13].

The infection may be limited to the growth of bacteria in the urine (which frequently don't produce symptoms) or it can result in several syndromes associated with an inflammatory response to the bacterial invasion.

Actually, the term UTI represent a wide variety of conditions, including asymptomatic forms of UTIs, urethritis, cystitis, acute pyelonephritis and pyelonephritis with bacteremia or sepsis [1,7,12] .

Urinary tract infections (UTI) are the second most common infectious disease, in which uropathogenic *Escherichia coli* (UPEC) causes approximately 80% of community-acquired infections and 40% of nosocomial infections [3,4,9,11,13].

The most common bacteria implicated as causative agents of UTI generally originate in the intestine and include but not limited to *E. coli, Pseudomonas spp, Streptococcus spp, Proteus spp., Klebsiella spp., Staphylococcus spp, Neisseria gonorrhoea, Chlamydia trachomatis, Candida spp, Mycoplasma.*

While UTIs can affect both men and women, they are far more prevalent in females. Approximately 50% of adult women report having had one or more UTIs, and some of these women will develop a history of repeated infections [3,7,8,11].

2. Material and Methods

Midstream urine specimens were collected from 3160 (1580 males and 1580 females) patients who

Correspondence: Aurora Bakaj, University Colleges Medicom, Vlorë, ; Email aurorabakaj@yahoo.com
(Accepted for publication 27 June 2013)
***ISSN**: 2218-2020, © Agricultural University of Tirana*

were admitted or visited the outpatient departments in the Health Directory, Durrës and had urinary tract infection confirmed by positive urine culture reports. The urine samples were collected into sterile bottles. As the ground for planting urine is used blood agar, endo agar, McConkey, etc..

Planting of urine in the terrain is done in such a way that we can count colonies and based on them to find the number of bacteria / ml urine; therefore are been developed quantitative methods of urine culture [6,11].

As the ground for planting urine is used blood agar, endo agar, McConkey, etc.. For *Proteus*, to avoid increasing its pervasive and allowing separate potential colony growth to be counted, we prepare the ground with the highest percentage agar (4-5%) by Sonnenwirth [4,9, 11].

The collection of samples was carried out in Durrës between January, 2012 - December, 2012. Data analysis was carried out on the basis of a preliminary plan using statistical package EpiInfo version 7.

3. Results and Discussion

A total of 3160 urine specimens were collected from patients suspected of having UTI, out of which a total number of 956 showed significant bacterial growth and were included in the study. Of the samples analysed, 956 strains of various bacteria were isolated, consisting of 447 (46.75%) from males and 509 (53.25%) from females as detailed in Figure. 1.

The gram-negative bacteria constituted the largest group with a prevalence of 863 (90.27%) while gram-positive bacteria constituted only some 93 (9.73%) of the total isolates. The bacteria isolated were *E. coli* (25.89%), *S. aureus* (2.94%), *P. vulgaris* (1.04%) and *P. aeruginosa* (0.38%). The highest proportion of isolates were *E. coli* (25.89%) and *S. aureus* (2.94 %) accounting for 95.2% of the total number of isolates recovered from the urine samples. Other less-frequent isolates in aggregate caused 4.8% of infections.

Viewing Table 1, we notice that people are more affected by Escherichia coli in a much higher percentage than the three other bacteria: *Proteus vulgaris*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

Pronounced prevalence of *Escherichia coli* in urinary tract infections, compared with other bacteria normally present in the gut, is indicative of a unique ability of this bacterium to invade, and to be placed in the urinary tract.

Different types of genus Proteus, are also considered as frequent agents of urinary tract infections. Proteus is invading bacterium and is directly related to infections of the upper urinary tract. Among opportunistic pathogenic bacteria as the cause of UTI is and *Pseudomonas aeruginosa*. This bacterium multiplies in environments with trace organic substances.

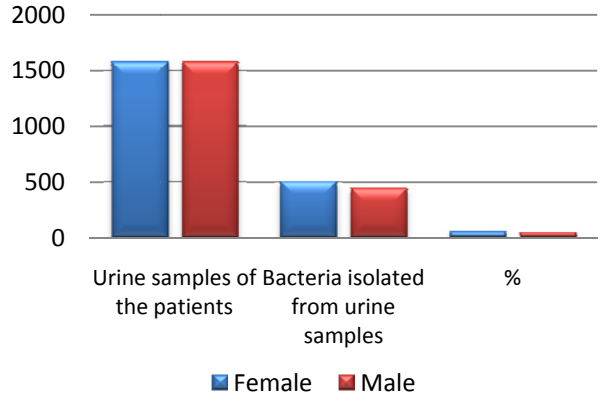

Figure 1. Bacteria isolated from urine samples

Table 1. Type of infection isolated from total urine samples.

Type of infection	*Frequency*	*Percent*	*Cumulative Percent*
Escherichia coli	818	25.89%	25.89%
Negative	2204	69.75%	95.63%
Proteus vulgaris	33	1.04%	96.68%
Pseudomonas aeruginosa	12	0.38%	97.06%
Staphylococcus aureus	93	2.94%	100.00%
Total	3160	100.00%	100.00%

Table 2. 95% Confidential limits for each type of infection isolated from total urine samples.

Type of infection	*95% Confidential limits*	
Escherichia coli	24.37%	27.46%
Negative	68.11%	71.34%
Proteus vulgaris	0.73%	1.48%
Pseudomonas aeruginosa	0.21%	0.68%
Staphylococcus aureus	2.39%	3.61%

Staphylococci are considered more contaminants of urine. In our results the most frequently between *Staphylococci* is *Staphylococcus aureus*.

Samples obtained from female subjects (53.25%) yielded more bacteria than those obtained from males (46.75). The sex distribution of patients in the present study was consistent with that of other studies [7,12].

Several reports have indicated that females are more prone to having UTIs than males, because the urethra is shorter in females than males and is easily more readily transverse by microorganisms [7]. Women's propensity to develop UTIs has also been explained on the basis of certain behavioral factors, including delays in icturation, sexual activity, the use of diaphragms and spermicidal (both of which promote colonization of the periurethral area with bacteria). Also, the length of the urethra, the dried environment surrounding the meatus, and the antibacterial properties of prostatic fluid contribute to a lower rate of infection in males.

In Figure 2 are presented sterile, negative and positive cases with bacteria. We emphasize that if you use a good hygiene in urine then emerges sterile culture, that is to say that we do not have any kind of bacteria growing in the ground; while negative cases are them that have 2-3 colonies, which are not taken into account.

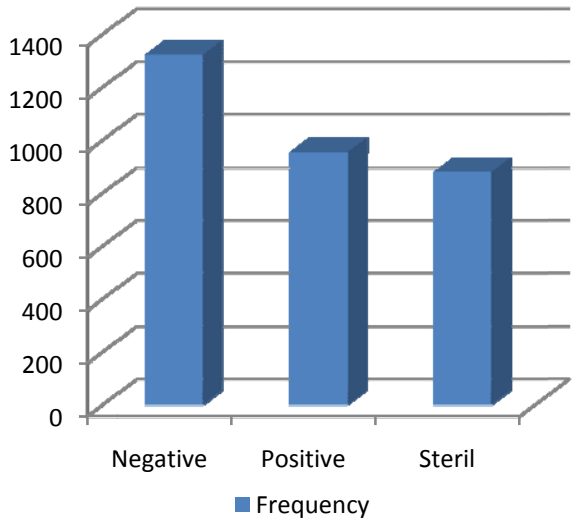

Figure 2. Positive, negative and sterile cases of urine samples

Of course, we have made an analysis by age. Ages which have proved most affected have been 61-75 years (38.8%) and 46-60 years to (20.41%). Often the risk of urinary tract infections increases with age, therefore people often have concerns and do the analysis in this age..

Bacteriological analysis of urine usually is made after clinical analysis in which the value of bacteria and leukocytes emerged over the rate.

Urine is a very good ground for the development of bacteria, especially gram-negative bacteria. Bakteriuria in clinical analysis of urine is almost always associated with specific bacteria of bacteriological analysis. Bacteria in the urine were found at a rate of about 69.75%.

Table 3. Frequency a bacteriological analysis by age group in total

Age Group	*Frequency*	*Percent*	*Cum. Percent*
≥ 76	420	13.29%	13.29%
1 - 15	275	8.70%	21.99%
16 - 30	326	10.32%	32.31%
31 - 45	268	8.48%	40.79%
46 - 60	645	20.41%	61.20%
61 - 75	1226	38.80%	100.00%
Total	3160	100.00%	100.00%

Companionship of bacterinuria of clinical analysis with *Pseudomonas aeruginosa* and *Proteus vulgaris*, are respectively 100% and 93.94% that is also seen in the low number of cases with these two types of bacteria. While compatibility for *Escherichia coli* is in the order of 95.1% and *Staphylococcus saprophyticus* is 91.4%. It explained that not always the first bacteria seen in a microscopy field for clinical analysis followed 100% of bacteria growing on selective grounds, and often the reason for not taking better the analysis. The same reasoning is and for the companionship of leukocytes with bacteria.

Urinary leukocyte compatibility with *Escherichia coli* is in the order of 95.1%. If we compare the bacteriuria with leukocituria, then we see that we shift small and not significant. If you want to see if there are correlations between each of the 4 and leukocituria bacteria in urine do the following analysis: From the table above, it appears that we correlation between leukocituri and bacteria *E.coli*. This is very important in the evaluation of urinary tract infections. Analysis was carried out by each bacterium according to sex (male / female).

On the basis of the urine samples we se that women, support better growth of *E. coli* compared to the male urine samples. In our study females are affected with *E. coli* by 52.4% compared to men who are affected only 47.6%. These differences between the sexes have to do with the pH of the urine and its osmolarity and this reinforces the hypothesis that among other factors, urinary tract infections occur more often in women.

Proteus vulgaris have a percentage of 57.6% for women and 42.4% for men. So again we have a higher percentage of women than men.

We have made an analysis based on the seasons. Distribution is different; therefore *E. coli* roof is in the summer, while in three other seasons have almost similar values. *P. vulgaris* have two peaks in winter and in summer; while two others: *P. aeruginosa* and *S.saprophyticus* have the same distribution almost the entire year.

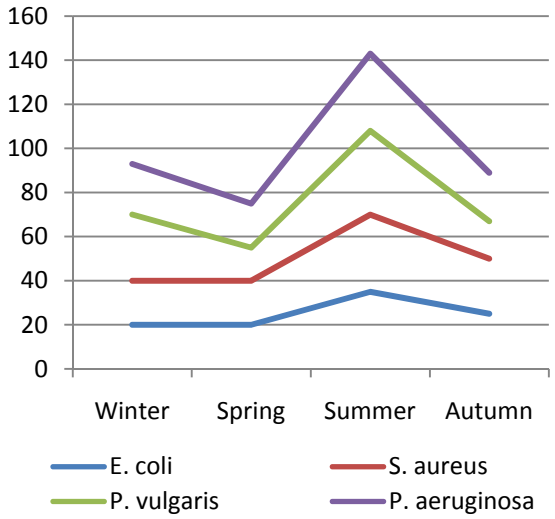

Figure 3. Distribution of cases according to the seasons

4. Conclusions

This paper describes a study undertaken to evaluate the prevalence and susceptibility patterns of bacterial strains isolated from patients diagnosed with UTIs in a referral Health Directory in Durrës, Albania.

Women are more susceptible to urinary tract infections, especially against *Escherichia coli*, resulting positive in 52.4% of cases; while *Proteus vulgaris* have a female percentage of 57.7%. This percentage increased slightly among women infected with *Staphylococcus saprophyticus* in 58% and low in 61.5% infected with *Pseudomonas aeruginosa*.

Greater frequency of infections with *Escherichia coli* and *Proteus vulgaris* is found in the hot summer season, which also affects many factors that have not been analyzed in this study.

5. References

1. Alcomo IE: **Bacterial reproduction and growth**. Microbiology; 1987: 116-126
2. Andoni R, Ibro M: **Infeksionet e traktit urinar**. Bakterologjia Klinike; 2004: 84-89
3. Atlas MR: **Urinary tract infections**. Microbiology, Fondamentals and Applications; 1998: 614.
4. Balows A, Hansler J, Hermann K, Isenberg H, Shadomy J: **Urinary tract pathogens**. In: Manual of Clinical of Microbiology; 1991: 186.
5. Benson JH: **Urinary tract pathogens**. Microbiological aplications; 2001:262-267.
6. Hysko M: **Urokultura**. Manual i mikrobiologjisë; 2007: 283
7. Kolawale AS, Kolawale OM, Kandaki-Olukemi YT, Babatunde SK, Durowade KA, Kplawale CF: **Prevalence of urinary tract infections among patients attending Dalhatu Araf Specialist Hospital, Lafia, Nasarawa State, Nigeria**. Int. J. Med. Med. Sci. 2009, **1**(5): 163-167
8. Lika (Çekani) M: **Sistemi urinar**. Histologjia; 2007: 274-285
9. Lika (Çekani) M**,** Kullaj A, Nelaj E, Meçe O: **Bacterial load in the human upper respiratory tract**. Albanian Journal of Agricultural Sciences (AJAS), 2011. Vol.10, 1: 39-44
10. Neu HC: **Urinary tract infections**. Am. J. Med. 1992, 92:63–70.
11. Papajorgji M, Kero A: **Diagnoza mikrobiologjike e infeksioneve të shkaktura nga E.coli dhe e infeksioneve të tjera.** Manual bazë mbi metodat diagnostike mikrobiologjike e bakterologjike; 2002: 80-82, 104
12. Ronald A: **The etiology of urinary tract infection: traditional and emerging pathogens**. Dis. Mon. 2003, 49: 71–82.
13. Sheffield J S, Cunningham F G: **Urinary tract infection in women**. Obstet Gynecol; 2005: 106, 1085-1092.