A Prospective Study of Urinary Tract Infections in Some Group of Population in Tirana, Albania

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Abstract

Four hundred peole were monitored for urinary tract infections (UTIs) in Tirana, Albania. The study included all the patients who were admitted or visited the outpatient departments in the Public Health Directory and had urinary tract infection confirmed by positive urine culture reports. As the ground for planting urine is used blood agar, endo agar, McConkey, etc. In the present study 103 (25.75%) of the samples were found to have significant bacteriuria and remaining 297 (74.25%) samples were found to have either non significant bacteriuria or very low bacterial count or sterile urine. Out of 103 isolated pathogens the most common isolate was *Escherichia coli* (19%), followed by *Staphylococcus saprophyticus* (1.75%), *Proteus vulgaris* (1.75%), group B *Streptococcus* (1%), *Klebsiella spp.* (0.75%) and *Pseudomonas aeruginosa* (0.50 %). Women are more susceptible to urinary tract infections, especially against *Escherichia coli*, resulting positive in 23% of cases; While *Staphylococcus saprophyticus* has a female percentage of 2%. In this study are presented significant data showing univariante analysis that accompanying leukocyturia with *Eschericia coli* is significant.

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

INTRODUCTION

The urinary tract (ie, kidney, ureter, bladder, and urethra) is a closed, normally sterile space lined with mucosa composed of epithelium known as transitional cells. The main defense mechanism against UTI is constant antegrade flow of urine from the kidneys to the bladder with intermittent complete emptying of the bladder via the urethra. This washout effect of the urinary flow usually clears the urinary tract of pathogens (Cox CE & Hinman Jr F, 1961).

The urine itself also has specific antimicrobial characteristics, including low urine pH, polymorphonuclear cells, and Tamm- Horsfall glycoprotein, which inhibits bacterial adherence to the bladder mucosal wall (Sobel JD, 1997).

A UTI is defined as colonization of a pathogen occurring anywhere along the urinary tract: kidney, ureter, bladder, and urethra. Traditionally, UTIs have been classified by the site of infection (ie, pyelonephritis [kidney], cystitis [bladder], urethra [urethritis]) and by severity (ie, complicated versus uncomplicated).

A complicated UTI describes infections in urinary tracts with structural or functional abnormalities or the presence of foreign objects, such as an indwelling urethral catheter. This model does not necessarily reflect clinical management, however.

UTIs are characterized by the presence of infectious agents in the genito-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 (Sheffield & Cunningham, 2005). 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.

Some people are more prone to getting a UTI than others. Any abnormality of the urinary tract that obstructs the flow of urine (a kidney stone, for example) sets the stage for an infection. An enlarged prostate gland also can slow the flow of urine, thus raising the risk of infection.

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 (Kunin, C. M. 1997; Neu, H. C. 1992).

MATERIALS AND METHODS

The definitive diagnosis of a UTI requires the isolation of at least one uropathogen from a urine culture. Urine, which should be obtained before the initiation of antimicrobial therapy, can be collected by various methods.

Midstream urine specimens were collected from 400 (200 males and 200 females) patients who were admitted or visited the outpatient departments in the Institute of Public Health, Tiranë 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 (Hysko M, 2007; Papajorgji M et al 2002).

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 (JH Benson, 2001; Papajorgji M et al 2002).

Data analysis was carried out on the basis of a preliminary plan using statistical package EpiInfo version 7.

RESULTS AND DISCUSSION

A total of 400 urine specimens were collected from patients suspected of having UTI, out of which a total number of 103 showed significant bacterial growth and were included in the study. Of the samples analysed, 103 strains of various bacteria were isolated, consisting of 44 (22%) from males and 59 (29.5%) from females as detailed in Figure 1.

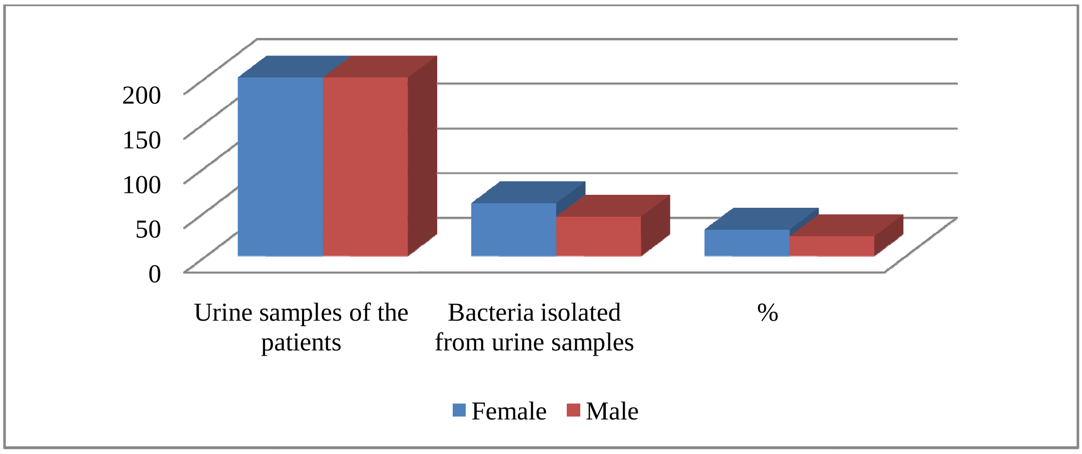

Figure 1. Bacteria isolated from urine samples

The gram-negative bacteria constituted the largest group with a prevalence of 90 (87.38%) while gram-positive bacteria constituted only some 13 (12.62%) of the total isolates. The bacteria isolated were *E. coli* (19%), *Proteus spp.* (1.75%), *Staphylococcus saprophyticus* (1.75%), *Streptococcus Group B* (1.00%), *Klebsiella spp.* (0.75%), *Enterococcus* (0.50%) and *P. aeruginosa* (0.50%).

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

Type of infection	***Frequency***	***Percent***	***Cumulative Percent***
Escherichia coli	76	19.00%	19.00%
Escherichia coli + Proteus spp.	1	0.25%	19.25%
Enterococcus	2	0.50%	19.75%
Klebsiella spp. + Proteus spp.	1	0.25%	20.00%
Klebsiella spp.	3	0.75%	20.75%
Negative	297	74.25%	95.00%
Proteus spp.	7	1.75%	96.75%
Pseudomonas aeruginosa	2	0.50%	97.25%
Staphylococcus	7	1.75%	99.00%

saprophyticus			
Streptococcus Group B	4	1.00%	100.00%
Total	400	100.00%	100.00%

The highest proportion of isolates were *E. coli* (73.78%), *Proteus spp.* (6.8%), and *Staphylococcus saprophyticus* (6.8%) accounting for 87.38% of the total number of isolates recovered from the urine samples. Other less-frequent isolates in aggregate caused 12.62% 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 spp.*, *Staphylococcus saprophyticus* and *Streptococcus Group B.*

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

Type of infection	***95% Confidential limits***	
E. coli	15.34%	23.27%
E. coli + Proteus spp.	0.01%	1.61%
Enterococcus	0.09%	2.00%
Klebsiella + Proteus spp.	0.01%	1.61%
Klebsiella spp	0.19%	2.36%
Negativ	69.62%	78.41%
Proteus spp.	0.77%	3.73%
Pseudomonas aeruginosa	0.09%	2.00%
Staphylococcus saprophyticus	0.77%	3.73%
Streptococcus Group B	0.32%	2.72%

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.

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

Group B Streptococcus, also known as *Streptococcus agalactiae* colonize the vaginal and gastrointestinal tracts in healthy women, with carriage rates ranging from 15%-45%. The absence of antibody to group B *Streptococci* in infants is a risk factor for infection.

Urinary tract infections are a common manifestation of group B *Streptococcal* disease and are observed in both pregnant and nonpregnant adults. Vaccine development was once promising, but shifting serotypes of group B streptococci responsible for clinical disease have limited this approach.

Analysis was carried out by each bacterium according to sex (male / female)(Aurora B. 2012). Samples obtained from female subjects (57.28%) yielded more bacteria than those obtained from males (42.72%). The sex distribution of patients in the present study was consistent with that of other studies (Snydman, 1991, Savas et al., 2006).

Table 3. Type of infection acording by gender

Type of infection	***Female***	***Male***
E. coli	23.00%	15.00%
E. coli + Proteus spp.	0.50%	0.50%
Enterococcus	1.00%	1.00%
Klebsiella + Proteus spp.	70.50%	0.50%
Klebsiella spp	1.50%	78.00%
Negativ	2.00%	2.00%
Proteus spp.	1.50%	1.00%
Pseudomonas aeruginosa	23.00%	1.50%
Staphylococcus saprophyticus	0.50%	0.50%
Streptococcus Group B	1.00%	15.00%

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 46.66% compared to men who are affected only 29.13%. 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.

Table 4. Pearson Correlation between gender and *E. coli*

Correlations		***Gender***	***E. coli***
Gender	Pearson Correlation	1	.102*
	Sig. (2-tailed)		.042

	N	400	400
E.coli	Pearson Correlation	.102*	1
	Sig. (2-tailed)	.042	
	N	400	400

*. Correlation is significant at the 0.05 level (2-tailed).

In Table 4. Is presented the Pearson correlation between gender and *E. coli.* Seeing from this table we can understand that the correlation between gender and *E. coli* is significant at the 0.05 level (2-tailed).

Several reports have indicated that females are more prone to having UTIs than males (Kolawale et al., 2009), because the urethra is shorter in females than males and is easily more readily transversed by microorganisms (Inabo and Obanibi, 2006).

Womens propensity to develop UTIs has also been explained on the basis of certain behavorial factors, including delays in icturation, sexual activity, the use of diaphragms and spermicides (both of which promote colonization of the periurethral area with bacteria). Also, the length of the urethea (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 hygienein 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.

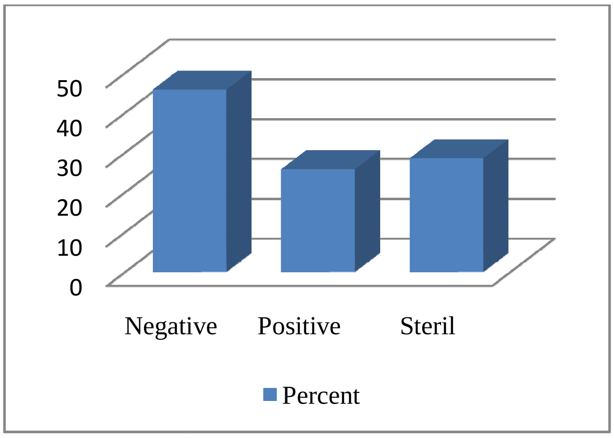

Figure 2. Positive, negative and sterile cases of urine samples

Table 5. 95% Confidential limits for each type of result.

Type of result	*95% Confidential limits*	
Negativ	40.81%	50.77%
Positiv	21.59%	30.38%
Steril	24.18%	33.24%

In Table 5. We can se the confidential limits for each type of result.

Of course, we have made an analysis by age. Ages which have proved most affected have been 61-75 years (31.75%) followed by 1 - 15 and 46-60 years with the same percentage to (16.75%). Often the risk of urinary tract infections increases with age, therefore people often have concerns and do the analysis in this age (Aurora B. 2012).

Table 6. Frequency a bacteriological analysis by age group in total

Age Group	*Frequency*	*Percent*	*Cum. Percent*
1 - 15	67	16.75%	16.75%
≥ 76	53	13.25%	30.00%
16 - 30	45	11.25%	41.25%
31 - 45	41	10.25%	51.50%
46 - 60	67	16.75%	68.25%
61 - 75	127	31.75%	100.00%
Total	400	100.00%	100.00%

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

If in preparation are identified bacteria, then urine analysis is considered positive for bakteriuria (1 ml urine over 100,000 bacteria) and continue with bacteriological analysis.

If in the preparation of the urine are diagnosed 10 or more leukocytes to the field, then and this urine sample is considered positive and advised to be done and bacteriological analysis.

Table 7. 95% Confidential limits for each age group

Age Group	*95% Confidential limits*	
1 - 15	13.30%	20.86%
≥ 76	10.16%	17.06%
16 - 30	8.41%	14.86%
31 - 45	7.54%	13.75%

46 - 60	13.30%	20.86%
61 - 75	27.26%	36.60%

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 26.25%.

Companionship of bacterinuria of clinical analysis with *Klebsiella spp.* and *Streptococcus Group B*, are 100 % 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 93.4% and *Staphylococcus saprophyticus* is 85.7%. 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 96 %. If we compare the bakteriuria 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.

Table 8. Pearson Correlation between leukocytes and *E. coli*

Correlations		***Leukocyte***	***E.coli***
Leukocyte	Pearson Correlation	1	.976**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	59.678	59.130
	Covariance	.150	.148
	N	400	400
E.coli	Pearson Correlation	.976**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	59.130	61.560
	Covariance	.148	.154
	N	400	400

******. Correlation is significant at the 0.01 level (2-tailed).

From the Table 8, it appears that the correlation between leukocituri and bacteria *E.coli* is significant at the 0.01 level (2-tailed). This is very important in the evaluation of urinary tract infections.

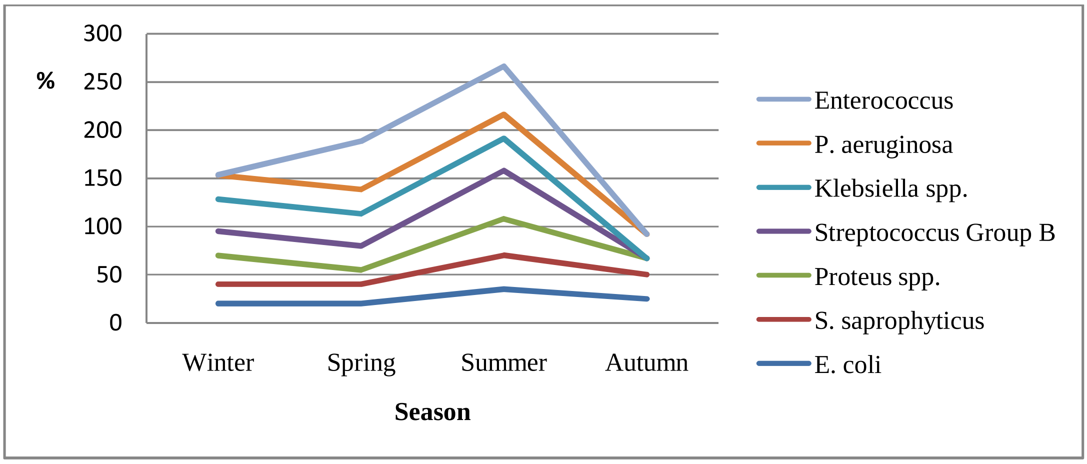

Fig. 3. Distribution of cases according to the seasons

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. *Pproteus spp.* have two peaks in winter and in summer; while the other: *P. aeruginosa*, *S.saprophyticus*, *Klebsiella spp* and *Streptococcus Group B* have the same distribution almost the entire year.

CONCLUSIONS

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

Women are more susceptible to urinary tract infections, especially against *Escherichia coli*, resulting positive in 60.53% of cases; While *Proteus spp.* have a female percentage of 42.85%. This percentage increased slightly among women infected with Staphylococcus saprophyticus in 57.14% and low in 66.67% infected with *Klebsiella spp.*.

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

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