

Microbial resistance in patients with urinary tract infections in Al-Mukalla, Yemen

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Abstract

Background: Urinary tract infection (UTI) is an aggravating and common problem in human at sometimes during their life and may give more complications.

Objective: To project antimicrobial resistance in patients with UTI as a wide problem among cases referred to the National Center of Public Health Laboratories in Ibn-Sina Teaching Hospital in Al-Mukalla, Hadhramout Governorate in Yemen.

Materials and methods: From 290 cases referred from Ibn-Sina Teaching Hospital outpatients, urine samples were tested and reported in the National Center for Public Health Laboratories at the period from 2003 to 2006. Data were obtained from the records of the center (for urine examination, culture and sensitivity test) and analyzed.

Results: Among 290 cases, 147(50.7%) were suffering from urinary tract infection. *E. coli*, which is the normal intestinal flora, was the most common isolate 52 (35.4%). *E. coli* showed high resistance against quinolones (84.6%) and penicillin (78.8%) and there was no resistance against macrolides.

Conclusion: Microbial resistance strains were high, which may be due to the abuse of antibiotics.

Keywords: Hadhramout, *E. coli*, macrolides, quinolones.

Urinary tract infection (UTI) is the second most common infectious presentation in community practice. World wide, about 150 million people are diagnosed as urinary tract infection each year, costing the global economy about 6 billion dollars¹.

Urinary tract infection may involve both the upper and lower tract or be confined only to the lower urinary tract². The majority of Urinary tract infection can be attributed to microbial species that are members of the intestinal micro flora, the most common of which are *E. coli*, *Klebsiella* species, *Enterobacter* species and *Proteus mirabilis*³.

Urinary tract infection is often treated with different antibiotics and the extensive uses of antimicrobial agent have invariably resulted in the development of antibiotic resistance.

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This in recent years has become a major problem world wide⁴.

There are no much information on etiology and resistance pattern of urinary tract infection in Yemen, so this study was carried out to elucidate the etiology of urinary tract infection and the antimicrobial resistance of the isolated uropathogene in patients with UTI attending outpatients clinics in Ibn-Sina teaching hospitals in Al-Mukalla city, Hadhramout Governorate (at East Yemen).

This study is important for clinicians, in order to facilitate the effective treatment and management of patient with symptoms of urinary tract infection.

Materials and Methods:

This is retrospective descriptive study performed by collecting up data from National Center for Public Health laboratories in Al-Mukalla.

The study included all cases referred from Ibn-Sina Teaching Hospital outpatients to the Center from January 2003 to December 2006 (the center stopped work for about 7 months from the 7th September 2005 to 13th March

2006 due to the reconstruction of the building).

Midstream urine samples for cultures were collected from 290 cases. Each specimen was inoculated into both blood agar and MacConkey agar plates using a 0.001 ml standard loop and incubated aerobically at 37°C for 24 hour, the number of colonies were counted. Urinary tract infection was defined as the culture of a single type of microorganism at a concentration of 10⁵ Colony Forming Unit (CFU)/ ml⁵.

Bacterial susceptibility for different antimicrobial agent was assessed according to Kirby-Bauer method⁶, using the following antimicrobial drugs: nalidixic acid, nitrofurantoin, trimethoprim, oxalonic acid, norfloxacin, amikacin, ofloxacin, ciprofloxacin and cephalixine.

The antimicrobial drugs were classified into groups according to pharmacological classification.

Results:

In this study the total number of cases was 290, males to females ratio was 1.6:1. Urine cultures and sensitivity tests were done for all cases and out of the total screened cases there were 147 positive cultures (50.7%), meaning urinary tract infection.

Out of the affected cases; there were 100 males (68%) (Table1). Most of the cases aged over 50 years (93 cases; 63.3%) especially in males (70%). Gram negative bacilli were isolated in 124 cultures (84.4%) while gram positive cocci were isolated only in 23 cultures (15.6%) which were mainly *Streptococcus* and *Staphylococcus*.

Table 1: Distribution of urinary tract infections by age groups and sex.

Age (yrs)	Sex (No.)		No. (%)
	Male	Female	
0-9	2	6	8 (5.4)
10-19	-	1	1 (0.7)
20-29	15	5	20 (13.6)
30-39	9	10	19 (12.9)
40-49	4	2	6 (4.1)
> 50	70	23	93 (63.3)
Total	100	47	147 (100)

The family of *Enterobacteriaceae* was isolated in 112 (90.3%) cultures from all gram negative bacilli. Moreover *E. coli* presented the highest prevalence in the family (35.4%), followed by *Enterobacter* (28%), *Citrobacter* (5.4%) and others (7.4%) (Table2).

Table 2: Frequency distribution of of uropathogens isolated in the National Center of Public Health Laboratories in Al-Mukalla, 2003-2006

Isolates	Total No. of cases (%)
<i>E. coli</i>	52 (35.4)
<i>Enterobacter species</i>	41 (28)
<i>Streptococcus</i>	15 (10.2)
<i>Pseudomonas species</i>	12 (8.2)
<i>Staphylococcus</i>	8 (5.4)
<i>Citrobacter species</i>	8 (5.4)
Others*	11 (7.4)
Total	147 (100)

*Others include: *Acinetobacter*, *Providencia*, *Klebsiella* and *Proteus*.

Regarding to antimicrobial resistance; *E. coli* presented high resistance to quinolones (84.6%), followed by (78.8%) to penicillin and by (73.1%) to cephalosporine while no resistance case was recorded to macrolides. The same results were obtained for *Enterobacter* species; they presented high resistance to penicillin (80.5%), cephalosporins (70.7%) and quinolones (70.7%) and there was a very small percentage resistant against macrolides (2.4%) (Table3).

Concerning the gram positive cocci, they presented different rates of resistance to penicillin, cephalosporin, tetracycline, quinolones and macrolides while chloramphenicol was the best drug to eradicate the bacteria.

Discussion:

Urinary tract infection is a wide spread problem among population with certain variations in the rate of infections regarding age and gender. Infections in males predominate than females in contrast to other studies⁷⁻⁹, this is because the target setting

Table 3: Antimicrobial resistance to uropathogens isolated in the National Center for Public Health Laboratories in Al-Mukalla.

Antibiotics group	P	Ceph	M	T	C	S	Q	AG	U T D	Total
Isolate	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No.
<i>E. Coli</i>	41(78.8)	38(73.1)	0(0)	26(50)	1(21.2)	31(59.6)	44(84.6)	22(42.3)	10(19.2)	52
<i>E. Species</i>	33(80.5)	29(70.7)	1(2.4)	13(31.7)	9(22)	14(34.1)	29(70.7)	24(58.5)	17(41.5)	41
<i>Streptococcus</i>	7(46.7)	9(60)	6(40)	8(53.3)	3(20)	8(53.3)	15(100)	8(53.3)	5(33.3)	15
<i>Staphylococcus</i>	5(62.5)	4(50)	3(37.5)	6(75)	1(12.5)	4(50)	5(62.5)	3(37.5)	2(25)	8
<i>P. Species</i>	9(75)	7(58.3)	0(0)	6(50)	2(16.7)	5(16.7)	11(91.7)	7(58.3)	5(41.7)	12
<i>C. Species</i>	8(100)	8(100)	0(0)	5(62.5)	4(50)	6(75)	6(75)	5(62.5)	2(25)	8
Others	10(90.9)	9(0)	0()	5(45.5)	4(36.4)	6(54.5)	7(63.6)	7(63.6)	5(45.5)	11

E. species=*Enterobacter Specie*. *P. species*=*Pseudomonas Species*. *C.species*=*Citrobacter specie*

P= Penicillin ,Ceph= Cephalosporins, M= Macrolides ,T= Tetracycline, S = Sulphonamide, Q= Quinolones , AG= Aminoglyco-sides
C=Chloramphenicole

UTD= Urinary Tract Disinfectants including: Nitrofurantoin (F), Novabiocine (NV) and Oxalinic acid (OX) .

for this study (In-Sina Hospital) includes medical and surgical specialties and not Gynecology/obstetric specialties; so most of patients were males.

Increasing age was associated with increase risk of urinary tract infection; the obtained results showed that most of the positive cases were from patients aged > 50 years. This may be due to the increasing health problems during senility.

The uropathogens identified in this study were similar to many other studies conducted in different countries¹⁰⁻¹³. Gram negative bacilli were the most isolated organisms (84.4 %) than gram positive organism. Most of the isolated organism belonged to the family of *Enterobacteriaceae* (90.3 %). *E. coli* presented the highest rate of isolates among this family.

Antibiotic resistance is a major problem in treating infection caused by microorganisms. The resistance to the antimicrobials has increased over the years and resistance rate vary from country to country. In our study, *E. coli* showed high resistance against quinolone (84.6%). This may be due to the fact that this antibiotic has been widely used in treating UTI over the past decade in this region.

In this study, the resistance of *E. coli* to penicillin was 78.8%. There were high variations in resistance to penicillins in different parts of the world; penicillin/betalactams were the best options for therapeutic treatment in Brescia (Italy)¹⁴ while ampicillin/amoxicillin are not suitable for empiric therapy of UTI in the west of Ireland, moreover ciprofloxacin is active against the majority of UTI associated with *E. coli* in West Ireland¹⁵ but it was reported that in many European countries; the susceptibility of *E. coli* isolates to penicillins was less than 60%¹⁶.

Enterobacter species, the second common organism in this study (28%) showed high resistance against penicillin (80.5%) and cephalosporins (70.7%). This high resistance was mainly due to widespread and indiscriminate use of these drugs. Higher resistance rate for most of the antibiotics used in this study may be explained by the

uncontrolled consumption of these antibiotics while the low resistance of other antibiotics in our region may be due to the fact that these drugs are not widely used and exposure to these antimicrobial is limited because of their high price and limited tolerability.

Conclusions:

In our population macrolide is the most active agent against gram negative bacilli especially *E. coli* and *Enterobacter*, while although with gram positive organisms, *Streptococcus* and *Staphylococcus* a resistance rate of 40% and 37.5% respectively was seen.

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