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# EPIDMOLOGICAL AND SENSITIVITY PATTERNS OF SPECIFIED ANTIBIOTICS INIMICAL TO PATHOGENS CAUSING URINARY TRACT INFECTIONS (UTIs)

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**ABSTRACT:** 100 urine specimens were cumulated for microbial urinalysis and antibiotic susceptibility appraisal, further infection boutade survey concerning gender and age was executed. From the microbial urinalysis it was exonerated that stereotyped urinary micro-organisms were *Escherichia coli, Enterococci, Klebsiella pneumonia, Staphylococcus aureus, Streptococci species, Pseudomonas aeruginosa* and *Candida albicans* which were isolated from 28 affirmative specimens. *Escherichia coli* (54%) and *Klebsiella pneumonia* (25%) were imperious bacterial species having same resistivity impressions as *Pseudomonas aeruginosa. Enterococcus was* exceptionally resistant bacterial specie while *Staphylococcus aureus* and *Streptococci species* were profoundly sensitive in sentiment to the exquisite antibiotics. Gender and age based survey adjured that fecunds and individuals beyond age of 50s are crucially supine to intermittent urinary infections, thus demands legitimate sanitation regime of privy lots.

**KEYWORDS:** Urinary Tract Infection, Antibiotic Sensitivity, Epidemiology.

## 1 INTRODUCTION

Urinary tract infections are a pathological condition that infects parts of urinary tract. It is trivially denoted as UTIs and is characterized as Acute cystitis. Infection of the upper urinary regions is entitled as Pyelonephritis or kidney infections, while infections of lower urinary quarters are signified as Simple cystitis or Bladder infections. Bacteria peculiarly *Escherichia coli, Staphylococcus saprophyticus*, *Klebsiella, Proteus, Pseudomonas, Enterococci and Enterobacter* are prevalent etiology of the infection [1]. Estimated 85% - 90% UTIs are founded via *E.coli,* rare fungal or viral onsets are inscribed [2]. Study evaluation divulges that women are more prone to infection due to their anatomy [3]. Urinary catheterization may also be a prime source of bacteriuria, leading to severe UTIs [4,5]. Symptoms of the infection comprehends burning sensations in urine, pyuria, hematuria, pyrexia, vaginal dispense, nausea and back pains [6]. Epidemiological survey proclaimed that women are the predisposed entities and frequency of infection per annum is computed as 10% [7]. Prospect of approximately 60% infection eventuate at some point of female lives [1]. Annually 40% of hospital beds are populated due to bladder and kidney infections [8]. Neonates at age less than one year are vulnerable to the indisposition, guesstimated 20% frequency of infection is diagnosed yearly. During pregnancy, soaring levels of progesterone surges likelihood towards bacterimia which escalates 20% - 40% chances of encountering a UTI [9]. Potential antibiotics are prescribed by the physicians to cope the mild to severe complications. Customarily dynamic antibiotics such as trimethoprim/sulfamethoxazole, cephalosporins, amoxicillin, clavulanic acid, nitrofrantoin or fluoroquinolones are prescribed along with Phenazopyridine and Paracetamols to subsist fevers, burning sensations and urgency. A research investigation published earlier in 2011 discerned that utilization cranberry juice and probiotics may assist to tackle recurrent infections [1,10].

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The research perusal was mapped on the basis to investigate pre-dominant bacterial and fungal microflora incredibly *Escherichia coli, Enterococci, Klebsiella pneumonia, Staphylococcus aureus, Streptococci species, Pseudomonas aeruginosa* and *Candida albicans* in the urine samples acquired from afflicted UTI patients, affirmed via episodes of biochemical tests. Then asserted predilected microbial colonies were prior to antibiotic sensitivity appraisal employing eloquent antibiotics. Finally epidemiological evaluation of accrued specimens was presided over to analyze upturns of UTI in the region.

## 2 METHODOLOGY

### 2.1 SPECIMEN COLLECTION

Urine specimens were racked up in sterile borate accommodating containers from 100 exasperated invalids enduring mild to severe urinary tract infection. The samples were processed within 24 hours of collection.

### 2.2 PHYSIOCHEMICAL PROPERTIES OF SPECIMEN

Physical color of urine specimens was varying from mild creamy yellow to vibrant orange, owing wavering tactile magnitude of turbidity. pH analysis via Multistix urine test strip manifested pH range of (5.5 – 7.5). The entire urine specimens were held at room temperature prior to examination.

### 2.3 MICROBIAL CULTURING

For microbial urinalysis of amassed specimens, sterile CLED (cysteine lactose electrolyte deficient medium, pH 7.3) agar plates were employed. The specimens were streaked evenly on the prepared sterilized medium as per described streaking protocols (Cappuccino et al., 2008). Then the cultured plates were sustained in the aseptic environment of laminar flow hood during culturing to avoid unwanted contamination. All the petri-plates were then incubated in upside down orientation at $37^{o}$C for 24 hours. Later on the culture status was observed morphologically.

### 2.4 MICROBIAL IDENTIFICATION

For identification phase, the bacterial colonies that were evidently proliferated on the CLED medium were further forged ahead through series of bacterial identification explorations including Gram staining, Catalase test, Coagulase test, Oxidase test, Indole test, Mannitol test and Methyl red test in order to specify UTI pathogens distinctively *Escherichia coli, Enterococci, Klebsiella pneumonia, Staphylococcus aureus, Streptococci species* and *Pseudomonas aeruginosa.*

For pathogenic yeast such as *Candida albicans, germ* tube test was conducted as per described protocol.

### 2.5 DISC DIFFUSION ANTIBIOTIC SENSITIVITY ASSESSMENT

Antibiotic sensitivity assessment of sterling yearned UTI pathogens was explored as per described protocols (Mohanty, 2010). UTI pathogens succeeding identification activity were exorcised on sterilized Muller-Hinton agar medium. Ten stellar antibiotics titled as Amoxicillin, Amikacin, Ceftriaxone, Cefixime, Ciprofloxacin, Fosfomycin, Imipenem, Piperacillin, Nitrofurantoin and Naladixic acid were assigned on the purified microbial culture plates. These plates were then incubated at $37^{o}$C for 24 hours. On the next day of incubation, coherent zones of inhibitions were observed conveying antibiotic sensitivity depiction.

## 3 RESULTS

### 3.1 MICROBIAL CULTURING

From microbial culturing, it was espied that out of 100 infected urine specimens, 28 were pathogenically UTI positive discerning that yenned pathogens particularly *Escherichia coli, Enterococci, Klebsiella pneumonia, Staphylococcus aureus, Streptococci species, Pseudomonas aeruginosa* and *Candida albicans* were responsible for (28%) of integral acute to chronic UTI cases. These pathogens some what reside as solo or co-infectious entities.

### 3.2 MICROBIAL IDENTIFICATION

Biochemical explorations were executed to identify prominent inimical UTI pathogens discriminatingly *Escherichia coli, Enterococci, Klebsiella pneumonia, Staphylococcus aureus, Streptococci species* and *Pseudomonas aeruginosa.* Microscopic germ tube test vouched the presence of *Candida albicans* mycelia. Compendium of results is indicated in (Table 1) and (Table 2). From these results its evident that urinary tract lurgy is predominantly caused by bacterium *Escherichia coli* that helm for about (54%) of sum total infection frequency. Relatively *Klebsiella pneumonia* is also accountable for the indisposition revealing moderate infection periodicity of (25%). *Enterococci, Pseudomonas aeruginosa* and *Candida albicans* own low infection regularity of (11%), (4%) and (7%), but its pathogencity leads to excruciating chronic maladies. *Staphylococcus aureus* and *Streptococci species* were remarked to be present as co-infectious quiddities and that ascends severity of disease. Compendium of results is indicated in (Graph 1).

**Table 1:** Tabular representation of convicted UTI pathogens isolated from infected urine specimens

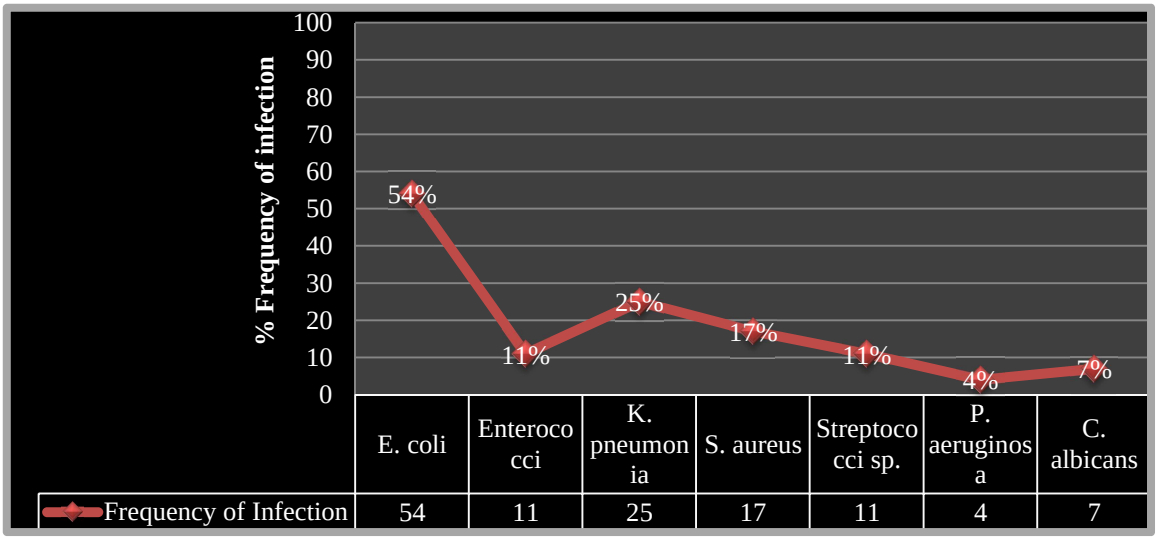
| List Of Bacteria | MICROBIAL IDENTIFICATION | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | MORPHOLOGY | GRAM STAINING | CATALASE TEST | COAGULASE TEST | OXIDASE TEST | INDOLE TEST | MANNITOL TEST | METHYL RED TEST |
| E. coli | Bacilli | + | - | - | - | + | - | - |
| Enterococci | Cocci | + | - | + | - | - | - | - |
| K. pneumonia | Bacilli | - | + | - | - | - | + | - |
| S. aureus | Cocci | + | + | + | - | - | + | + |
| Streptococci sp. | Cocci | + | - | - | - | + | - | + |
| P. aeruginosa | Bacilli | - | + | - | + | - | - | - |
| C. albicans | Visible mycelial or budded growth under microscope (40X or 100X) | | | | | | | |

**(+)** cue regard for positive sequel, **(-)** cue regards for negative sequel

**Table 2:** Tabular representation of convicted UTI pathogens declared as microbial resource

| SAMPLE NO. | MICROBIAL SPECIES DISCERNED FROM URINE SPECIMENS | | | | | | |
|---|---|---|---|---|---|---|---|
| | E. COLI | ENTEROCOCCI | K. PNEUMONIA | S. AUREUS | STREPTOCOCCI SP. | P. AERUGINOSA | C. ALBICANS |
| 1 | + | - | - | - | - | - | - |
| 2 | + | - | - | - | - | - | - |
| 3 | + | - | - | - | - | - | - |
| 4 | + | + | - | - | - | - | - |
| 5 | - | - | - | + | - | - | + |
| 6 | - | - | + | + | - | - | - |
| 7 | - | - | + | - | - | - | - |
| 8 | - | - | - | - | + | - | - |
| 9 | - | - | - | - | - | + | - |
| 10 | + | - | - | - | - | - | + |
| 11 | + | - | - | - | - | + | - |
| 12 | + | - | + | - | + | - | - |
| 13 | - | - | + | - | - | - | - |
| 14 | - | + | - | - | - | - | - |
| 15 | - | - | - | + | + | - | - |
| 16 | - | - | - | - | - | - | + |
| 17 | + | + | - | - | - | - | - |
| 18 | + | - | - | - | - | - | - |
| 19 | + | - | - | - | - | - | - |
| 20 | - | - | + | - | - | - | - |
| 21 | - | - | + | - | - | - | - |
| 22 | + | - | - | - | - | - | - |
| 23 | + | - | + | - | - | - | - |
| 24 | + | - | - | - | - | - | - |
| 25 | - | - | + | - | - | - | - |
| 26 | + | - | - | - | - | - | - |
| 27 | - | - | + | - | - | - | - |
| 28 | + | - | - | - | - | - | - |

**(+)** cue regard for positive sequel, **(-)** cue regards for negative sequel



**Graph 1:** Pictorial representation of prevalence of microbial infection via convicted UTI pathogens

### 3.3 DISC DIFFUSION ANTIBIOTIC SENSITIVITY ASSESSMENT

From sensitivity examination of aced atibiotics against the adverse UTI pathogens it was espied that *Staphylococcus aureus* and *Streptococcus species* growth were vehemently restrained by almost all of the plied antibiotic disc. Gram negative *Escherichia coli, Klebsiella pneumonia* and *Pseudomonas aeruginosa* accounted for same resistivity patterns against the antibiotics with least variability i.e. Fosfomycin was benign towards *Pseudomonas aeruginosa* while *Klebsiella pneumonia* desists the effectiveness of Nitrofurantoin. *Enterococci* were most resistant bacterial specie and were responsive only towards Fosfomycin, Imipenem, Piperacillin and Nitrofurantoin. Antibiotics i.e. Amoxicillin and Naladixic acid had no cogency to restrain bacterial augmentation. Fungal pathogen *Candida albicans* was resistant towards the dynamic potency antibiotics. Compendium of results is indicated in (Table 3).

**Table 3:** Tabular representation of sensitivity patterns of virtuoso antibiotics against convicted UTI pathogens

| LIST OF BACTERIA | ANTIBIOTIC SENSITIVITY PATTRENS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | AMOXICILLIN | AMIKACIN | CEFTRIAXONE | CEFIXIME | CIPROFLOXACIN | FOSFOMYCIN | IMIPENEM | PIPERACILLIN | NITROFURANTOIN | NALADIXIC ACID |
| E. coli | R | S | R | R | R | S | S | S | S | R |
| Enterococci | R | R | R | R | R | S | S | S | S | R |
| K. pneumonia | R | S | R | R | R | S | S | S | R | R |
| S. aureus | R | S | R | R | S | S | S | S | S | R |
| Streptococci sp. | R | S | R | R | S | S | S | S | S | R |
| P. aeruginosa | R | S | R | R | R | R | S | S | S | R |
| C. albicans | R | R | R | R | R | R | R | R | R | R |

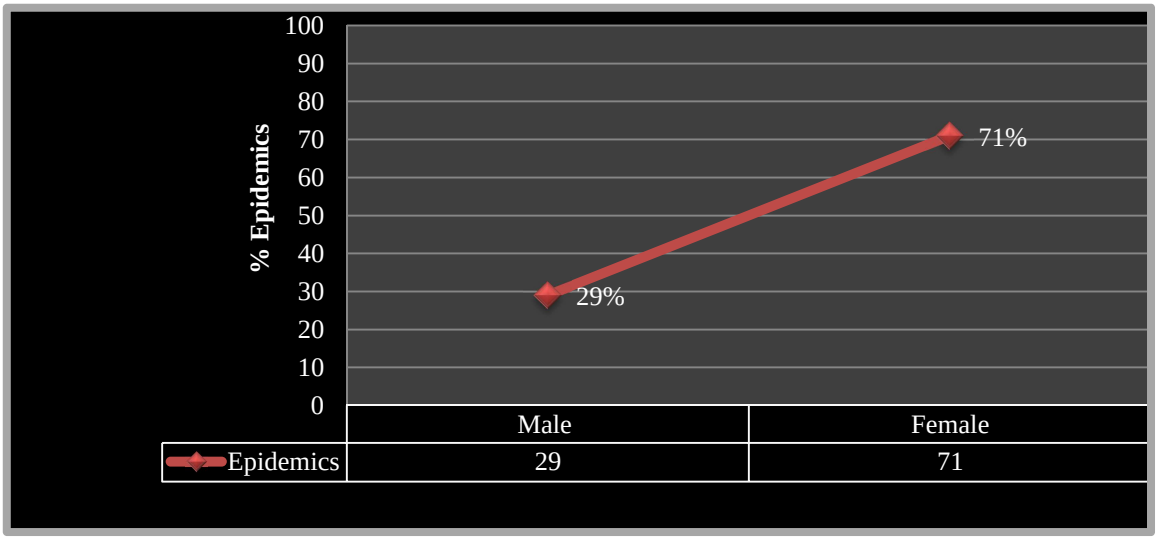
**(S)** cue regard for positive sequel, **(R)** cue regards for negative sequelEpidemics Of UTIs With Respect To Gender And Age

Pervading disposition of urinary tract infection is idiosyncratically based on pathogenicity of micro-organisms, their remarkable character of invasion, persistence, decamping host defenses, infection genesis and recurrence of reiterative infections owing more resistance towards medications. From the epidemic study it has been espied that conventionally two substantial aspects are superintended for the regularity of the ailment i.e. Gender and Age. From the evaluation survey of 28 positive urine specimens out of 100, it was manifested that females are most prone to the infection due to their indispensible anatomy. Estimated probability of infection frequency for females was (71%) while for males it was (29%), signifying high infection rate in females. Compendium of results is indicated in (Table 4) and (Graph 2).With respect to age, estimated probability of invalids manifested that individuals above the age of 50s are more liable to onset and recurrent urinary infection due to their incapacitated immunity and impecunious health care. Infection frequency for individuals above age of 50 is computed as (64%) evincing higher obstinate microbial infection rates. Compendium of results is indicated in (Table 4) and (Graph 3).

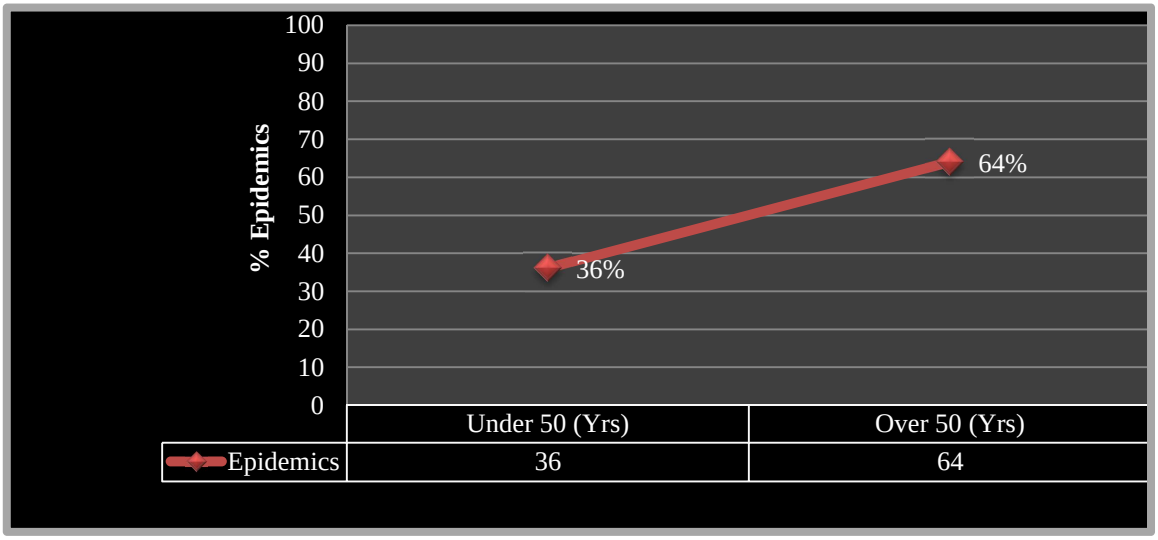
**Table 4:** Tabular representation of epidemics of UTIs on the basis of gender and age

| SAMPLE NO. | EPIDEMICS OF UTIs | |
|---|---|---|
| | GENDER | AGE (YRS) |
| 1 | F | 55 |
| 2 | F | 53 |
| 3 | M | 75 |
| 4 | F | 74 |
| 5 | F | 35 |
| 6 | F | 48 |
| 7 | F | 55 |
| 8 | F | 62 |
| 9 | M | 60 |
| 10 | F | 79 |
| 11 | F | 71 |
| 12 | F | 70 |
| 13 | F | 70 |
| 14 | F | 9 (MONTHS) |
| 15 | F | 73 |
| 16 | F | 85 |
| 17 | M | 70 |
| 18 | M | 42 |
| 19 | F | 40 |
| 20 | F | 60 |
| 21 | F | 2 |
| 22 | F | 62 |
| 23 | F | 55 |
| 24 | M | 45 |
| 25 | M | 78 |
| 26 | M | 38 |
| 27 | M | 33 |
| 28 | F | 3 |

**(M)** cue regard for Male sex, **(F)** cue regards for Female sex




**Graph 2:** Pictorial representation of epidemics of UTIs on basis of convalescent's gender




**Graph 3:** Pictorial representation of epidemics of UTIs on basis of convalescent's age

## 4 DISCUSSIONS

From a research exploration over sighted randomly on culled populace of elderly and robust youthful proffers, it was refuted that urinary tract infection is rampant specifically in middle aged and elderly women due to their diacritic biology [11]. Most preponderant cause of debilitation are bacteria pivotally *Escherichia coli*. Patients bordering on $>10^5$ bacteria (CFU)/ml of freshly void sample are diagnosed with symptomatic UTIs [12]. Currently antimicrobials are employed to encounter urinary prodromes but still clinging on few backlashes [13]. United States review in 1995 insinuated that annual expense on UTI remedial therapy was augmented up to $25.5 billion. To rig the coeval situation cinch vaccine should be established to preclude onslaught of introductory contagion [14].

## 5 CONCLUSION

From the research manifestation, it has been concluded that gram negative *Escherichia coli* (54%) and *Klebsiella pneumonia* (25%) were presiding ascendant of urinary tract infections. Other bacterial and fungal species pretenced as opportunistic organisms which dilapidate acute infection to chronic stages. Fosfomycin, Imipenem, Piperacillin and Nitrofurantoin were the most commendable bateriostatics and bactericides to repress the proliferation of pathogenic bacteria. Fungal mycelial growth was not inhibited by the antibiotics and which require a potential route to impede infection rate. Proper medication should be prescribed by the physicians in order to circumvent microbial resistance and sporadic

infections. Individuals at age above 50s, exceptionally females must emulate the standards of hygiene care discretely of intimate areas in order to stay healthy and avoid urinary tract related maladies.

## REFERENCES


[1] S. Salvatore, E. Cattoni, G. Siesto, M. Serati, P. Sorice, and M. Torella, "Urinary tract infections in women", *European Journal of Obstetrics, Gynecology, and Reproductive Biology*, vol. 156, no. 2, pp. 131–6, 2011.

[2] S. M. Bagshaw and K.B. Laupland, "Epidemiology of intensive care unit-acquired urinary tract infections", *Current Opinion in Infectious Diseases*, vol. 19, no. 1, pp. 67–71, 2006.

[3] L. E. Nicolle, "The chronic indwelling catheter and urinary infection in long-term-care facility residents". *Infect Control Hosp Epidemiol*, vol. 22, no. 5, pp. 316–21, 2001.

[4] E. J. Dielubanza and A.J. Schaeffer,"Urinary tract infections in women", *The Medical clinics of North America,* vol. 95, no. 1, pp. 27–41, 2011.

[5] L. E. Nicolle, "Uncomplicated urinary tract infection in adults including uncomplicated pyelonephritis",*Urol Clin North Am*, vol. 35, no. 1, pp. 1–12, 2008.

[6] D. R. Lane and S. S. Takhar, "Diagnosis and management of urinary tract infection and pyelonephritis", *Emergency medicine clinics of North America,* vol. 29, no.3, pp. 539–52. 2011.

[7] R. Colgan and M. Williams,"Diagnosis and treatment of acute uncomplicated cystitis", *American Family Physician*, vol. 84, no. 7, pp. 771–6, 2011.

[8] Brunner and Suddarth, Textbook of medical-surgical nursing, 12th Ed. Philadelphia. Wolters Kluwer Health/Lippincott Williams & Wilkins, pp. 1359, 2010.

[9] F. Smaill and J. C. Vazquez, "Antibiotics for asymptomatic bacteriuria in pregnancy", *Cochrane Database Syst Rev, vol.* 18, no. 2, pp. 490, 2007.

[10] R.G. Jepson, G. Williams, and J. C. Craig, "Cranberries for preventing urinary tract infections." *Cochrane database of systematic reviews*, vol. 16, no. 4, pp. 126, 2012.

[11] D. J. O'Sullivan, M. G. FitzGerald, M. J. Meynell, and J. M. Malins, "Urinary Tract Infection", *British Medical Journal,* vol. 1, no. 5228, pp. 786–788, 1961.

[12] B.L. Jasmine and H. N. Guy, "Urinary tract infection", *Medicine,* vol. 35, no. 8, pp. 423–428, 2007.

[13] H. R. Robert, D. S. Eugene, T. A, Vincent, J. D, Robert, and E. S. Walter, "Evaluation of new anti-infective drugs for the treatment of urinary tract infection", *Clinical Infectious Diseases,* vol. 15, no. 1, pp. 216-227, 1992.

[14] B. Foxman, R. Barlow, H. D'Arcy, B. Gillespie, and J. D. Sobel, "Urinary Tract Infection", *Annals of Epidemiology,* vol. 10, no. 8, pp. 509-515, 2000.