DOI: https://doi.org/10.53350/pjmhs221610698

ORIGINAL ARTICLE

Frequency of Common Bacteria and Antibiotic Sensitivity in Patients with Indwelling Catheter Associated Urinary Tract Infections

MUHAMMAD AYAZ[1], SHAHEER AHMAD KHAN[2], MUHAMMAD DAUD KHALIL[3], SALMAN KHAN[4], SYED JALAL SHAH[5], NAQEEB ULLAH[6]

[1]Assistant Professor Medicine, Muhammad Teaching Hospital & Muhammad College of Medicine, Peshawar
[2]Senior Registrar DHQ Teaching Hospital, KDA, Kohat
[3,4]TMO Medicine, Rehman Medical Institute, Peshawar
[5]Registrar Medicine, Muhammad Teaching Hospital, Peshawar
[6]Medical Officer, General Medicine, Agha Khan Foundation
Corresponding author: Shaheer Ahmad Khan, Email: drshaheer55@gmail.com

ABSTRACT

Objective: Examine the prevalence of common bacteria and their antibiotic susceptibility in individuals with urinary tract infections caused by indwelling catheters.

Study Design: Cross-sectional descriptive research.

Place and Duration of study: From January 30, 2021, to July 29, 2021, researchers from the Department of Medicine at Muhammad Teaching Hospital in Peshawar, collected data for this study.

Materials and Methods: The proportion of patients with Enterococcus spp. urinary tract infections[2] was 5.4%, with a 95% confidence interval and a 3.5% margin of error using WHO software, and they monitored 179 individuals. In addition, a non-probabilistic sampling method based on a sequence of samples was applied.

Results: Based on our data, the median age was 47 years old (with a standard deviation of ±2.15), and 33% of our participants were male and 67% were female. Escherichia coli was detected in 37% of patients with catheter linked urinary tract infection, Staphylococcus epidermidis in 18%, Pseudomonas aeruginosa in 16%, Klebsiella pneumonia in 20%, Proteus mirabilis in 3%, and Enterococcus in 6%.

Conclusion: Escherichia coli (37%) was the most prevalent bacterium found in catheter-associated urinary tract infections, followed by Klebsiella pneumonia (20%), Staphylococcus epidermidis (18%), and Pseudomonas aeruginosa (16 percent).

Keywords: Infection of the urinary tract caused by a catheter, urinary catheterization, CAUTI. E. coli, microorganisms, antibiotics, and infectious diseases.

INTRODUCTION

Urinary catheterization, where the catheter remains in the patient's urine tract, is a common medical treatment for urinary retention and incontinence. Many patients (between 21 and 50 percent) are put at risk for a variety of problems due to its frequent and sometimes unneeded use. One study found that catheterized patients had three times the chance of hospitalization, and required antibiotic medication, as non-catheterized residents. The most common complication of an indwelling catheter is a urinary tract infection (UTI) contracted in a healthcare facility; this illness is referred to as a catheter-associated UTI (CAUTI). Not only do catheter-associated UTIs have a huge economic impact, but they also have serious consequences. Eighty percent of all nosocomial UTIs are CAUTIs, and CAUTIs account for more than 40% of all nosocomial infections in hospitals and nursing homes[1]. In addition, multidrug-resistant strains are frequently to blame for hospital-acquired CAUTIs, necessitating stronger medications that can spread to other patients[2]. The prevalence of CAUTI was 37.5 percent, as reported by Bi XC et al[3].

An indwelling catheter allows for the constant introduction of bacteria into the urinary bladder. Bacteria enter the urinary system during insertion, resulting in colonization in up to 20% of patients shortly after catheterization. Seventy to eighty percent of bacteriuria cases are seen in women, whereas only 20 percent are found in men (20-30 percent). Escherichia coli, Staphylococcus epidermidis, Proteus mirabilis, Pseudomonas aeruginosa, Klebsiella pneumoniae, Enterococcus spp., and Candida spp. are only some of the bacteria and yeasts that can be found in the human body.[4,5] CAUTIs were discovered in 29.09% of patients, with a slightly lower rate of occurrence in females, according to a study by Bagchi I et al (24.35 percent vs. 34.29 percent of those diagnosed). E. coli was found to be the most prevalent pathogen (at 34.85%), followed by Klebsiella spp. (19.7%), Pseudomonas spp. (12.12%), Candida spp. (10.6%), Enterococcus spp. (at 6.06%), CONS (at 6.06%), Staphylococcus aureus (at 4.55%), Citrobacter spp. (at 3.03%), and Pro (3.03 percent).[2] In a separate study, Sabir S. et al. identified the bacterium responsible. Eighty percent of the time, E. coli was the bacteria isolated, followed by 9.4 percent of the time for Staphylococcus aureus, 5.4 percent for Proteus species, and 5.2 percent for Pseudomonas spp.[5]

Asymptomatic infections are often left untreated because bacteriuria is not eliminated or quickly reoccur. Antibiotics are the sole effective treatment for symptomatic infections such bacteremia, prostatitis, epididymitis, and pyelonephritis[4]. However, bacteriuria employs numerous strategies to evade antibiotic treatment. Cefotaxime was used to treat the majority of patients (89.7%), followed by ceftazidime/cephradine (73.8%), tetracycline (69.4%), doxycycline (66.6%), augmentin (62.6%), gentamycin (59.8%), cefuroxime (58.2%), ciprofloxacin (54.2%), cefaclor (50%) and aztreonam (44.8%). (11.2 percent).[5] Patients with CAUTIs were split into two groups, and Onyegbule OA et al. compared their symptoms and outcomes. Ampicillin (66.7%), Gentamycin (55.6%), Ceftriaxone (33.3%), Nitrofurantoin (40.0%), and Amoxycillin-clavulanic acid (80%) were the antibiotics with the highest and lowest levels of resistance, respectively, in the antibiotic susceptibility pattern of various isolates (11.1 percent and 20 percent).[6]

Urinary tract infections (UTIs), and in particular UTIs caused by catheters, are one of the most common types of infections and a major source of economic and emotional distress for communities around the world. Further, the expanded spectrum of bacterial isolates has endangered the empirical use of several antibiotics by providing resistance. The pattern of bacterial resistance also appears to differ geographically. Antibiotic abuse and overuse is viewed as the root cause of the problem of antibiotic resistance in Pakistan. However, there is no evidence of widespread national monitoring in these areas, and the data currently available are insufficient to provide an accurate estimate of the scale of the problem[7-9].

Therefore, the purpose of this study is to identify common bacteria and the antibiotics that are effective against them in people who have urinary tract infections that are linked to having a catheter left in place permanently. To reduce the morbidity associated with CAUTIs, this research will aid in detecting the local trend of common bacteria and will be utilized to develop recommendations for the use of empirical antibiotics during catheterization. In addition, our study's findings on the prevalence

of common bacteria and their antibiotic susceptibility will inform our development of guidelines for pre- and post-operative care that would aid in lowering the incidence of catheter-associated UTIs.

MATERIALS AND METHODS

From January 30, 2021, to July 29, 2021, researchers at Muhammad Teaching Hospital in Peshawar collected data in the hospital's medical department. The prevalence of Enterococcus spp. in patients with catheter-associated urinary tract infections2 was 5.4%, with a 95% confidence interval and a 3.5% margin of error using WHO software, in a descriptive cross-sectional investigation involving 179 patients.

Inclusion Criteria:

1. Patient population at risk for catheter-related urinary tract infections.
2. Individuals of any sex, aged 16-65, as patients.

Exclusion Criteria:

1. Patients who have been treated with antibiotics within the previous five days.
2. Patients who have an aberrant anatomy of the urinary tract.
3. All of the aforementioned circumstances serve as confounders that, if included in the study, would induce bias.

Data Collection Procedure: The study was carried out with the blessing of the hospital's research and ethics board. Patients who met the study's inclusion criteria were recruited through the outpatient clinic and the emergency room. The patient was given information about the trial and its potential benefits before giving their written consent. To reduce the potential for bias and control for potential confounders, a comprehensive history and physical examination was performed on all patients.

Every patient who was involved in the study had a urine sample taken using stringent aseptic protocols after they developed a urinary tract infection following catheterization. This was done so that the hospital laboratory could culture the sample and look for common bacterial isolates. Ceftriaxone, ciprofloxacin, and gentamycin were tested for their efficacy against the identified pathogen. All of the culture and sensitivity testing was overseen by a single consultant microbiologist, a CPSP fellow with at least five years of relevant experience.

In a standard form, we recorded data such names, ages, pregnancy statuses, and parities.

Data Analysis Procedure: Information was gathered using a standardised form and evaluated in the most recent release of SSPS. Age and other quantitative data were subjected to mean + SD calculations. Categorical factors were analysed using frequency counts and percentages, including gender, catheter-associated UTIs, most-common bacteria, and antibiotic sensitivity. Bacteria often found in CAUTIs and their antibiotic susceptibility were stratified by age and gender to examine the impact of changes. Both tabular and graphical representations of the data were provided. After dividing the population into subsets, a chi-square test was used to assess if there was a statistically significant difference between the groups.

RESULTS

The Department of Medicine at Muhammad Khan Hospital in Peshawar tracked 179 persons with indwelling catheter-associated urinary tract infections to find out what kinds of bacteria are most common and how effectively antibiotics work against them.

The findings show that 10% (18 patients) were between the ages of 16 and 25, 15% (27 patients), 20% (36 patients), 25% (45 patients), 30% (53) were between the ages of 46 and 55, and 30% (53) were between the ages of 56 and 65. The median age was 47, while the standard deviation was only 2.15 years. (as shown by the data in Table 1)

After conducting a gender breakdown, we found that 60 (66%) of our patients were female and 30 (4%) were male.

(Demonstrated in Table 2)

Sixty-six patients (37 percent) were found to have a catheter-associated urinary tract infection, while one hundred and thirteen patients (63 percent) did not.

(Demonstrated in Table 3)

Table 1: Distribution of Ages (N=179)

Age	Frequency	%
16-25 years	18	10%
26-35 years	27	15%
36-45 years	36	20%
46- 55 years	45	25%
56-65 years	53	30%
Total	179	100%

Standard deviation (SD) of age was 47 ± 2.15 year

Table 2: (N=179) Gender Distribution

Gender	Frequency	Percentage
Male	59	33%
Female	120	67%
Total	179	100%

Table 3: Catheter-Related Uti (N=179)

Catheter Associated Urinary Tract Infection	Frequency	Percentage
Yes	66	37%
No	113	63%
Total	179	100%

Table 4: Common Bacteria (N=66)

Common Bacteria	Frequency	Percentage
Escherichia coli	24	37%
Staphylococcus epidermidis	12	18%
Pseudomonas aeruginosa	11	16%
Klebsiella pneumonia	13	20%
Proteus mirabilis	2	3%
Enterococcus	4	6%
Total	66	100%

Table 5: Cau Classification By Age (N=179)

Catheter Associated UTI	16-25 years	26-35 years	36-45 years	46-55 years	56-65 years	Total
Yes	6	10	13	17	20	66
No	12	17	23	28	33	113
Total	18	27	36	45	53	179

The chi-square test yielded a P value of 0.003.

Table 6: Catheter-Associated Urinary Tract Infections By Gender (N=179)

Catheter Associated UTI	Male	Female	Total
Yes	22	44	66
No	37	76	113
Total	59	120	179

A chi-square test was performed, and the resulting P value was 0.002.

Table 7: Stristification of Common Bacteria With Age (N=66)

Common Bacteria	16-25 years	26-35 years	36-45 years	46-55 years	56-65 years	Total
Escherichia coli	2	4	5	6	7	24
Staphylococcus epidermidis	1	2	2	3	4	12
Pseudomonas aeruginosa		2	2	3	4	11
Klebsiella pneumonia	1	2	2	3	5	13
Proteus mirabilis				1	1	2
Enterococcus			1	1	2	4
Total	4	10	12	17	23	66

Chi Square test was applied in which P value was 0.004

Table 8: Stristification Of Common Bacteria With Gender (N=66)

Common Bacteria	Male	Female	Total
Escherichia coli	8	16	24
Staphylococcus epidermidis	4	8	12
Pseudomonas aeruginosa	4	7	11
Klebsiella pneumonia	4	9	13
Proteus mirabilis	1	1	2
Enterococcus	1	3	4
Total	22	44	66

The chi-square test yielded a P value of 0.003.

Among 66 cases of catheter-associated urinary tract infection, Escherichia coli was detected in 24 (37%), Staphylococcus epidermidis in 12, Pseudomonas aeruginosa in 11, Klebsiella pneumonia in 13, Proteus mirabilis in 2, and Enterococcus in 6%. (Demonstrated in Table No. 4)

Tables 5, 6, 7, and 8 show the age and gender-based bacteria and catheter-associated UTI distribution patterns.

Table 9: Antibiotic Sensivity of Catheter Associated Uti (N=66)

Causative Organism Identified	Ceftriaxone	Amikacin	Tetracycline	Ciprofloxacin	Augmentin	Ceftazidime	Nitrofurantoin
E- Coli n=24	S=8(35) R=16(65)	S=8(35) R=16(65)	S=1(7) R=23(93)	S=8(35) R=16(65)	S=9(37) R=15(63)	S=6(27) R=18(73)	S=1(7) R=23(93)
Staphylococcus n=12	S=5(40) R=7(60)	S=4(30) R=8(70)	S=4(30) R=8(70)	S=5(40) R=7(60)	S=4(30) R=8(70)	S=5(40) R=7(60)	S=3(20) R=9(80)
Pseudomonas n=11	S=4(35) R=7(65)	S=4(35) R=7(65)	S=1(7) R=10(93)	S=4(40) R=7(60)	S=4(30) R=7(70)	S=3(27) R=8(73)	S=1(7) R=10(93)
Klebsiella n=13	S=4(29) R=9(71)	S=4(29) R=9(71)	S=2(14) R=11(86)	S=4(29) R=9(71)	S=4(29) R=9(71)	S=2(14) R=11(86)	S=2(14) R=11(86)
Proteus n=2	S=1(50) R=1(50)	S=1(45) R=1(65)	S=(0) R=2(100)	S=1(50) R=1(50)	S=1(50) R=1(50)	S=1(50) R=1(50)	S=(0) R=2(100)
Enterococcus n=4	S=1(35) R=3(65)	S=1(35) R=3(65)	S=(0) R=4(100)	S=2(50) R=2(50)	S=2(50) R=2(50)	S=2(50) R=2(50)	S=(0) R=4(100)

DISCUSSION

Urinary catheterization, where the catheter remains in the patient's urine tract, is a common medical treatment for urinary retention and incontinence. Many patients (between 21 and 50 percent) are put at risk for a variety of problems due to its frequent and sometimes unneeded use. One study found that catheterized patients had three times the chance of hospitalisation, and required antibiotic medication, as non-catheterized residents. The most common complication of an indwelling catheter is a urinary tract infection (UTI) contracted in a healthcare facility; this illness is referred to as a catheter-associated UTI (CAUTI). Not only do catheter-associated UTIs have a huge economic impact, but they also have serious consequences. Eighty percent of all nosocomial UTIs are CAUTIs, and CAUTIs account for more than 40% of all nosocomial infections in hospitals and nursing homes[10]. In addition, multidrug-resistant strains are frequently to blame for hospital-acquired CAUTIs, necessitating stronger medications that can spread to other patients[11-13]. Researchers Bi XC, et al., observed that 37.4% of patients were diagnosed with CAUTI.

According to our numbers, the average age was 47 and the SD was 2.15. One-third of the patients were male and two-thirds were female[14-17]. Bagchi I et al. discovered that 37% of CAUTI patients had Escherichia coli, 18% had Staphylococcus epidermidis, 16% had Pseudomonas aeruginosa, 20% had Klebsiella pneumonia, 3% had Proteus mirabilis, and 6% had Enterococcus. The study found that E. coli made up 34.85% of the pathogens found, followed by Klebsiella spp. (19.7%), Pseudomonas spp. (12.12%), Candida spp. (10.6%), Enterococcus spp. (6.06%), CONS (6.06%), Staphylococcus aureus (4.55%), Citrobacter spp. (3.13%), and Proteus spp (3.03 percent). (3.03 %) Three percent; 0%; 3%. The bacterium responsible for the infection was identified in a follow-up investigation conducted by Sabir S. et al. E. coli was the most often isolated bacteria at 80%, followed by Staphylococcus aureus at 9.4%, Proteus species at 5.4%, and Pseudomonas spp. at 1.6%. The current rate stands at 5.2%.

In my research, I found that the infection rate was 68% when the catheter was in place for a week or less, and it rose to 100% after a week. Another American study[31] confirms this correlation between infection and prolonged urethral catheter insertion (days 4+). In contrast to what was found in another study[32], this rate is significantly greater. Using a closed drainage system, the infection rate among patients with an indwelling catheter was less than 25% in this study. This suggests that the closed drainage method used in our research, and the maintenance of catheters more generally, warrant increased focus. Catheter use should be restricted to a small subset of patients so as to lessen the overall number of people exposed to potential harm.

Older age is a host factor that can increase the risk of UTI caused by a catheter. Our study's patients had a mean age of 37, with the largest age group being 40-60 years old (40 percent). Another study[33] confirms that indwelling catheters are a prominent source of UTIs in the elderly.

It was found that a total of 68% of patients (34/50) contracted an infection despite the fact that preventive systemic antibiotics were given to all patients as standard practise following catheter insertion. Antibiotic prophylaxis following catheterization has been proven to be ineffective in a number of studies, including our own, and may even contribute to the growth of resistant bacteria.[34]

In my research, Escherichia coli was the most often isolated pathogen, followed by Pseudomonas, Klabsiella, Staphylococcus, and proteus. This distribution trend was seen in a local study of 966 patients at Shah Abdul Latif University Khair Pur. The most common bacteria responsible for UTIs in this study were E. coli, Klebsiella, and proteus. This finding is consistent with the findings of another retrospective study conducted in Norway, which identified E. Coli as the most common organism discovered in hospitals.[35] Many of these pathogens are already present in the patient's endogenous gut flora; nonetheless, it is possible that some of these infections were contracted by exposure to infected solutions or non-sterile equipment, or from other patients or hospital staff.

Of the individuals in my study, 84% had a single-microorganism infection, whereas 15% had multiple microorganisms recovered. Despite the fact that another study shows that catheter-associated UTIs are typically polymicrobial.[34] That wasn't the case in the research we conducted[29].

Most urinary infections in our environment are resistant to routinely used antibiotics as Cephalosporins and Fluoroquinolones, as shown by the antimicrobial susceptibility pattern. Cath-associated UTIs are often treated on a "empirical" basis, which may contribute to the emergence of this high-resistance trend. In Particular, the increased resistance of gramme negative pathogens to the fluoroquinolones is concerning as these are reserve medications for treating resistant infection several other studies[36,37] have nevertheless underlined the danger of overuse of these drugs with subsequent development of resistance, the consequence of which are beginning to observe in our environment.

Our results suggest that bacteriuria is unavoidable with long-term catheterization, so we recommend that patients have their catheters changed at regular intervals to avoid the buildup of obstructive concretions and subsequent infections. Routine use of prophylactic systemic antibiotics is not warranted because it has led to the development of antibiotic-resistant bacteria, even if such drugs have been shown to postpone the start of bacteriuria in catheterized patients.

The results of susceptibility tests performed on isolated microorganisms should serve as a guidance for the treatment of catheter-associated UTI.

CONCLUSION

Escherichia coli (37%) was the most prevalent bacterium found in catheter-associated urinary tract infections, followed by Klebsiella pneumonia (20%), Staphylococcus epidermidis (18%), and Pseudomonas aeruginosa (2%). (16 percent).

REFERENCES

1. Jacobsen SM, Stickler DJ, Mobley HL, Shirtliff ME. Complicated catheter-associated urinary tract infections due to Escherichia coli and Proteus mirabilis.ClinMicrobiol Rev. 2008; 21(1):26-59.
2. IndranilBagchi, Neelam K Jaitly, V.R.Thombare. Microbiological evaluation of catheter associated urinary tract infection in a tertiary care hospital. Intern J Bio Health Sci. 2013;1(2):1-10
3. Bi XC, Zhang B, Ye YK, He HC, Han ZD, Dai QS, Liang YX, Zeng GH, Wang YS, Chen QB, Zhong WD. Pathogen incidence and antibiotic resistance patterns of catheter-associated urinary tract infection in children.JChemother. 2009 Dec; 21(6):661-5.
4. Tenke P, Kovacs B, Bjerklund Johansen TE, Matsumoto T, Tambyah PA, Naber KG. European and Asian guidelines on management and prevention of catheter-associated urinary tract infections.Int J Antimicrob Agents. 2008 Feb; 31Suppl 1:S68-78.
5. Sabir S, Ahmad Anjum A, Ijaz T, Asad Ali M, Ur Rehman Khan M, Nawaz M. Isolation and antibiotic susceptibility of E. coli from urinary tract infections in a tertiary care hospital.Pak J Med Sci. 2014 Mar; 30(2):389-92.
6. Onyegbule OA, UdigweGO, Ezebialu I, Nduka AC, Okolie VE, Okor OL. Catheter-Associated Urinary Tract Infection Following Caesarean Section in Nnewi, Nigeria: A Prospective Comparative Study. Bri Microbio Res J. 2014; 4(9):1026-34.
7. Iqbal T, Naqvi R, Akhter SF. Frequency of urinary tract infection in renal transplant recipients and effect on graft function. J Pak Med Assoc. 2010; 60(10):826-9.
8. Tanvir R, Hafeez R, Hasnain S. Prevalence of Multiple Drug Resistant Escherichia coli in Patients of Urinary tract infection Registering at a Diagnostic Laboratory in Lahore Pakistan. Pak J Zool. 2012; 44:707-12.
9. Abdul JKP, Abdul Rahim K, Abdul HYS, Sanaullah K. Current antibiotic susceptibility in Khyber Teaching Hospital Peshawar (NWFP) Pakistan. GomalUni J Res. 2008; 13:224-9Kreger BE, craven DE, Mc Cabe WR.Gram-negative bacteremia IV. Re-evaluation of clinical features and treatment in 612 patients AmJ Med 1980;68:344-55.
10. Selden R Lee S, Wang WLL, et al. Nosocomial Klebsiella infections: intestinal colonization as a reservoir- Ann intern Med 1971; 74:657-64.
11. Mumtaz S, Mumtaz A. Valve of urine nitrate test in the diagnosis of urinary tract infections. The J Surg 2001;21-22:36-37
12. Tariq KM, Shah S. Humayun experience with gram negative bacilli isolated from 400 cases of urinary tract infections. J Ayub Med coll Abbottabad 2000; 12(4):21-23.
13. Snell RS. The Abdomen part II, The Abdominal cavity clinical anatomy by regions. 8th ed. Philadelphia: Lippincott Willims & Wilkins. 2008;260-357.
14. Chaurasia BD. The urinary bladder and the urethra. Human Anatomy: Regional and applied dissection and clinical vol 2nd, 4ed ed. New Delhi: CBS publishers & distributors 2004;345-51.
15. R Orenstein E.S, Wong. Urinary tract infection in adults. American family physician.1999.
16. Stull TL, Li Puma PJ. Epidemiology and natural Story of urinary tract infection in children. Med Clin North Am 1991; 75:287-97.
17. Karram MM, Mallipeddi PK. Lower urinary tract infection. In Walters MD. Urogynecology and Reconstructive pelvic surgery. 2nd edition. St Louis (MO) Mosby, 1999; 341-45.
18. Meares EM JR. Non speciyic infection of the genitourinary tract. In: Tanagho EA, Mc Aninch JW, eds. Smith,s general urology, 14th ed. Norwalk: Appletion & Lange, 1995;201-44
19. Grapey DS, Shaeffeo AJ. Urinary tract infection. In: Raz S, ed. Female urology,2nd ed. Philadelphia: WB Saunders, 1996;183-96.
20. Stamm WE, Counts GW, Running KR, Fihn S, Turck M, Holmes KK. Diagnosis of Coliform infection in acutely dysuric women. N Engl.J Med 1982;307:463-68
21. Stamey TA. Pathogenesis and treatment of urinary tract infections. Blatimore; Williams and Wilkins, 1980.
22. Farrel DJ, Morrissey I, De Rubei SD et al. A UK Multicentre Study of the antiimicrobiol susceptibility of bacterial pathogens causing urinary tract infection. J Infec 2003;46(2):94-100
23. Joseph B. Abdelmalak MD: Jeannette M, Potts MD. Urinary tract infection in adults. The Cleveland clinic urological institute 2004;1-8.
24. Bats JM, Raffi HM, Prasadn K et al. Tamm-Horsfall protein knockout mice are more prone to urinary tract infection: rapid communication. Kidney int 2004;65(3):797-7
25. Samuelsson P, Hang L, Wullt B et al. Toll- like receptor 4 expression and cytokine responses in the human urinary tract mucosa. Infect immun 2004;72(6):3179-86.
26. Bergsten G, Children Samuelsson M, Wullt B et al. Pap G-dependent adherence breaks, mucosal inertia and triggers the innate host response. J infect dis 2004; 189(9): 1734-42
27. Kaper JB, Nataro JP, Mobley HL. Pathogenic Escherichia Coli. Nat Rev Microbiol 2004;2(2):123-40
28. Mazouni C, Karsenty G, Bladou F, Serment G. Urthral device in women with chronic urinary retention: An alternative to self catheterization? Eur J Obstet Cynecol Reprod Biol 2004;115(1):80-84
29. Stickler DJ, Jones GL, Russell AD. Control of encrustation and blockage of foley catheters, Lancet 2003;361(9367):1435-37.
30. Nawaz M. Isolation and antibiotic susceptibility of E. coli from urinary tract infections in a tertiary care hospital.Pak J Med Sci. 2014 Mar; 30(2):389-92.
31. Garibaldi RA, Burke JP, Dickman ML, smith CB. Factors predisposing to bacteriuria during indwelling urethural catheterization. N Engl J Med.1974;291:215-18
32. Kunin CM. Urinary Catheter Associated infection in the elderly. INT J Antimicrob Agent. 2006;28:78-71.
33. Oni AA, Mbah GA, Oguneunle MO, Shittu OB, Bakare RA. Nosocomial infection. Urinary tract infection in patients with indwelling urinary catheter. AFO J Clin Exper. Microbiol. 2003;4:63-71.
34. Memon BA. Pre dominant and common cause of urinary infections in Sukkar city Rawal.Med J 2007;32:99-101.
35. Livermore DM, James D, Reached M etal. Trends in fluoroquisalones (cipoafloracin) resistance in enterobacteriacase from bacteremias (England and wales) 1990-1999 Enog infect Dis 2002; 8:473-78.
36. Daini OA, Ogbolu OD, Ogunledun A. Quinolone resistance and R-plasmids by some gram-negative enteric bacilli. AFO J Clin exper Microbiol 2005; 6(1):15-21.
37. Nawaz M. Isolation and antibiotic susceptibility of E. coli from urinary tract infections in a tertiary care hospital.Pak J Med Sci. 2014 Mar; 30(2):389-92.