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RESEARCH ARTICLE

Study of Culture and Sensitivity pattern of microorganisms in urinary tract infection at a tertiary care hospital

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Abstract

Background: Urinary tract infections are one of the commonest infections that we encounter in hospital practice. A simple urinary analysis (urine full report) is a good screening test but in order to confirm the diagnosis and to find out the causative organism a urine culture is required. **Objectives:** To determine microorganisms responsible for urinary tract infection in patients of a tertiary care hospital and their antibiotic susceptibility pattern. **Materials and Methods:** This study was conducted in a tertiary hospital at Lucknow, Uttar Pradesh between January 2014 and June 2014 to check the changing pattern of antibiotic sensitivity among uropathogens causing urinary tract infections (UTI). A total of 200 urine culture sensitivity reports were analyzed. **Results and Observations:** The predominant growth of single bacteria was seen in 160 (80.0%) samples. The most common organisms isolated were Escherichia coli, klebsiella, Streptococcus faecalis, Staphylococcus aureus and pseudomonas. (These represented 59.37%, 95; 20.6%, 33; 6.25%, 10 ; 5.0%, 08 and 3.75%, 06 of isolates respectively). More than 80% of the isolates were sensitive to amikacin and nitrofurantoin, while more than 35% were sensitive to norfloxacin and levofloxacin. Very high rate of resistance was seen against amoxicillin (78.65%) and amoxi-clav (62.55%). **Conclusion:** The choice of drugs in the treatment of UTI is quite narrow today due to the wide scale resistance that the common UTI pathogens show to drugs which have been used previously. It is clear from the present study that nitrofurantoin, flouroquinolones and minocyclines are good choices for the treatment of outpatients. To tackle the upcoming problems of ESBL producing E.coli, nitrofurantoin is again a good choice along with amikacin.

Introduction

Urine in the human bladder is normally sterile. The presence of bacteria in the urine is called bacteriuria[1]. Bacteriuria may be asymptomatic or show apparent symptoms of urinary tract infection[2].Neonates, girls, young women, and older men are most susceptible to UTIs. In women, bacterial cystitis is the most common bacterial infection. Every woman has a 60% lifetime risk of developing bacterial cystitis, which develops mostly before the age of 24. By contrast, men have a lifetime risk of only 13%[3]. In children approximately 5% of girls and 1% of boys have a UTI by 11 years of age[4]. It is also the most common cause of nosocomial infections in adults. Urinary tract infection is said to exist when pathogenic microorganisms are detected in the urine, urethra, bladder, kidney, or prostate with or without the presence of specific symptoms.

UTIs are most commonly caused by Escherichia coli[5]. Other gram negative bacteria are Klebsiella spp, Enterobacter spp., and Pseudomonas aeruginosa, Proteus spp. Gram positive organisms include Enterococcus spp, Staphylococci and Streptococci and account for 5 to 15 % of the cases[6]. Despite of the fact that wide range of antibiotics is available against UTI, it remains one of the most common infections and is responsible for significant morbidity. The quality of life is affected with UTI and may have serious consequences of developing renal damage.

Resistance of antibiotics is yet another serious problem. This is due to overuse as well as misuse of antibiotics that resistance of antibiotics is increasing day by day[7]. The micro organisms responsible for the UTIs are mostly bacteria. The treatment of choice for complicated UTI is antibiotics. The antibiotics commonly used to treat UTIs are broad spectrum cephalosporins, floroquinolones and aminoglycosides. In patients with suspected UTI, antibiotic treatment is usually started empirically, before urine culture results are available. To ensure appropriate treatment, knowledge of the organisms that cause UTI and their antibiotic susceptibility is mandatory[8]. As both temporal and local variables can modify these data, they need to be constantly re-evaluated to achieve a maximal clinical response before the antibiotic susceptibility the isolate is known.

Aim and Objectives:

The present study was aimed to determine microorganisms responsible for urinary tract infection in patients of a tertiary care hospital and their antibiotic susceptibility pattern.

Material and Methods:

A total of 200 urine culture sensitivity reports were analyzed of patients who were suspected to be having urinary tract infection, from January 2014 to June 2014 with prior permission from Institutional Ethical Committee of M.V. Hospital and Research Centre, Lucknow. Clean-catch midstream urine specimens from patients diagnosed clinically to be having UTI on the basis of symptoms (fever, dysuria & increased frequency of urination) were inoculated on Blood Agar and McConkey Agar plates, which were incubated aerobically at 37 deg C overnight. Plates showing growth suggestive of significant bacteruria, with colony counts exceeding 10^5 cfu/ml were subjected to standard biochemical tests for identification and antimicrobial susceptibility testing by Kirby- Bauer disc diffusion method. Interpretation as 'Sensitive' or 'Resistant' was done on the basis of the diameters of zones of inhibition of bacterial growth as recommended by the disc manufacturer. Antibiotics against which sensitivity was tested in the present study included Amoxycillin, Amoxiclav, Norfloxacin, Levofloxacin, Co-trimoxazole, Gentamicin, Amikacin, Nitrofurantoin, Imipenam, Cefotaxim and Cefuroxime.

Identification of uropathogens: Identification of the isolated bacterial pathogens was done on the basis of gram staining, morphology and biochemical characters. [TSI agar, indole reaction, citrate, urease, MR, VP and motility agar (Oxoid B D)].

Antimicrobial Susceptibility Testing: For the positive cultures, antibiotic sensitivity discs were put on the Muller Hinton agar plates. The plates were incubated at 37 deg C for 18-24 hours. The results of sensitivity plates were read after 24 hours. Negative cultures were re incubated for another 24 hours and report was given as no growth at the end of 48 hours of incubation. Antimicrobial sensitivity of the isolated pathogens was determined by using Kirby Bauer Disc Diffusion method according to CLSI Clinical and Laboratory Standards Institute 2010)[9,10]. The antibiotics tested were amikacin, nitrofurantoin, co-trimoxazole, imipenam, cefotaxime, cefalexin, levofloxacin, norfloxacin, cefuroxime, Amoxycillin, Amoxiclav and Gentamicin.

Result and Observations:

A total 200 urine samples were analyzed for isolation and identification of bacterial isolates. Out of which 160 (80.0%) samples were found to have significant bacteriuria and remaining 40 samples were found to have either non significant bacteriuria or very low bacterial count or sterile urine. In the present study, out of all isolated pathogens the most common isolate were Escherichia coli (59.37%), followed by Klebsiella pneumonia (20.60%), Streptococcus faecalis (6.25%), Staphylococcus aureus (5.0%), Candida (3.12%), Pseudomonas (3.75%) and Proteus (1.87%). (Table I)

Table I: Distribution of isolated urinary tract pathogen and their respective percentage

S.No.	Organism isolated	Total	Percentage %
1	Escherichia coli	95	59.37
2	Klebsiella pneumoniae	33	20.60
3	Streptococcus faecalis	10	6.25
4	Staphylococcus aureus	08	5.00
5	Pseudomonas aeruginosa	06	3.75
6	Candida	05	3.12
7	Proteus	03	1.87

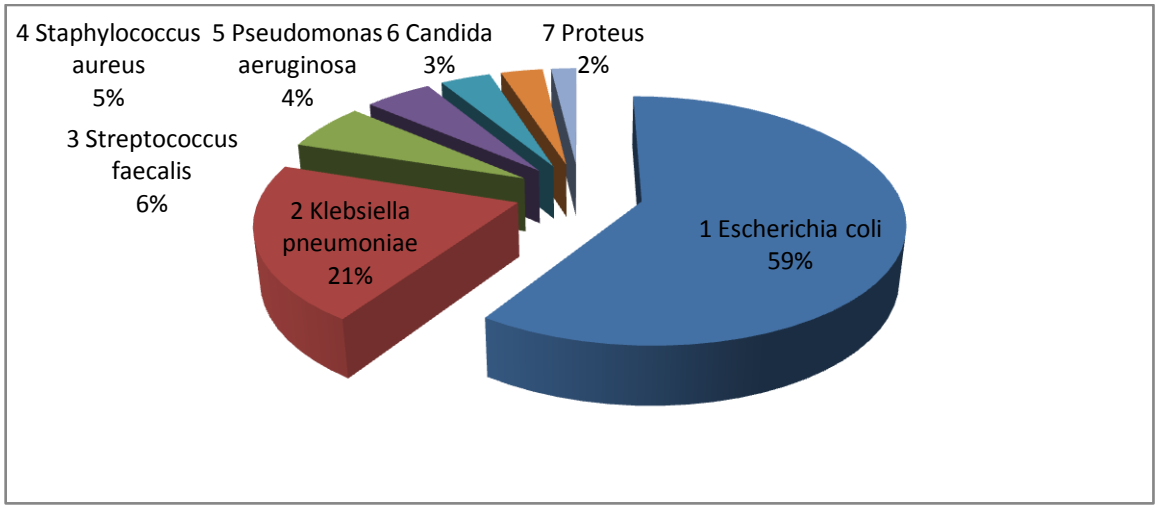

Figure 1: Percentage distribution of Urinary pathogens

Antimicrobial sensitivity testing of various isolated uropathogens was done by using Kirby Bauer Disc Diffusion method, according CLSI Clinical and Laboratory Standards Institute 2010)[10-12]. At the end of incubation period, the diameter of the zones of inhibition around each disc was measured with vernier calipers on the back of plate, with reflected light against a dark non-reflected background. Twelve antibiotics commonly used were tested against the isolated organisms. Amikacin was found to be the most effective drug (89.11%) followed by nitrofurantoin (88.27%). (Table II)

Table II: Percentage distribution of uropathogens sensitivity and resistance to antibiotics.

S.No.	Antibiotics	Sensitivity %	Resistance %
1	Amikacin	89.11	10.89
2	Nitrofurantoin	88.27	11.73
3	Co-trimoxazole	70.50	29.50
4	Imipenam	78.90	21.10
5	Cefotaxime	44.35	55.65
6	Cefalexin	47.56	52.44
7	Cefuroxime	13.50	86.50
8	Levofloxacin	40.00	60.00
9	Norfloxacin	34.65	65.35
10	Amoxycillin	21.35	78.65
11	Amoxiclav	37.45	62.55
12	Gentamicin	65.70	34.30

Discussion:

Urinary tract infection is one of the most common types of infectious diseases encountered in the practice of medicine these days. A total of 200 urine specimens, suspected for urinary tract infection were processed for culture. 160 were found to be culture positive.

According to our study E. coli was the commonest cause of urinary tract infection (59.37%) followed by Klebsiella pneumonia (20.60%), Streptococcus faecalis (6.25%), Staphylococcus aureus (5.0%), Candida (3.12%), Pseudomonas (3.75%) and Proteus (1.87%). It was different from other studies which reported E. coli 24% [13] and 66%,[14] the most frequent uropathogen. This was similar to other studies where it was the most frequent pathogen causing UTI, as in a study, 2010 Mohammad MT where 62.6% cultures grew E coli.[15]and 66% E. coli in a study, 2010 Mohammad Naeem et al in Islamabad.[14] These results were also similar with a study conducted by Dilnawaz S et al 2005, which reflects that first two common organisms were E coli and Klebsiella pneumoniae. Third prevalent organism in our study was Streptococcus faecalis while in the above mentioned study it was Pseudomonas.[9]

In the context of antibiotic sensitivity, our results were comparable with a study by Mohammad MT et al 2010, which revealed that imipenem (94.20%) was most effective drug against urinary E coli followed by amikacin (93.11%).[15] We found that amikacin (89.11%) was most effective antibacterial against urinary E. coli followed by nitrofurantoin (88.27%) and imepenem (78.90%) and then co-trimoxazole (70.50%). According to our results cefalexin was 47.56% sensitive, cefotaxime was 44.35% sensitive. According to above mentioned study, ceftazidime was 90.57% effective, cefotaxime was 19.20% and pipedemic acid was 13.40% effective.[15]

The sensitivity of E. coli to cefotaxime, cephalexin and cefuroxime was found to be 44.35%, 47.56%, and 13.50% respectively. A possible reason for this might be presence of extended spectrum beta lactamases (ESBL) in these strains. This problem is increasing day by day in our community.

The selection of antibiotic against any urinary tract pathogen depends on the antibiotic resistance pattern, its pharmacokinetic properties, dose quantity and timings, its effect on gastrointestinal tract and vaginal flora allergies and adverse effects caused by that drug. Antimicrobial resistance is a big problem cause of great concern through out the world. Knowledge of the antibacterial resistance among uropathogens is essential to provide appropriate cost effective therapy.

Conclusion:

In conclusion one can truly affirm that the choice of drugs in the treatment of UTI is quite narrow today due to the wide scale resistance that the common UTI pathogens show to drugs which have been used previously.

Drugs like cotrimoxazole and aminopenicillins which were considered as effective against uropathogens, are now rarely prescribed as empirical therapy in areas where resistance rate to theses antibiotics is high. But it is clear that nitrofurantoin, flouroquinolones and minocyclines are good choices for the treatment of outpatients. To tackle the upcoming problems of ESBL producing E.coli, nitrofurantoin is again a good choice along with amikacin.

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