Pattern and Sensitivity of Microorganisms Causing Urinary Tract Infection at Teaching Hospital

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ABSTRACT

OBJECTIVE: To determine the pattern and sensitivity of pathogens causing urinary tract infection at tertiary care hospital.

METHODS: Using clean catch method, urinary samples were collected from patients admitted in Urology Ward, Liaquat University Hospital Jamshoro from 1st January 2011 to 31st December 2011 who had suspected urinary tract infection. Samples sent to Diagnostic and Research Laboratory at Pathology Department, Liaquat University of Medical and Health Sciences, Jamshoro. All samples were tested by international standard method under supervision of qualified microbiologist. Antibiotic sensitivity of isolated micro-organisms was tested for commonly used antibiotics by Kirby Baur technique.

RESULTS: Out of admitted patients total of 458 samples were sent during study period. Significant bacteriuria was found in 335 (73.14%) samples, insignificant bacteriuria in 23 (5.02%) samples, while 100 (21.8%) samples were sterile. The most common pathogens isolated were E.Coli in 297 (64.41%) samples, Klebseilla Spp and Enterobacter each in 51 (11.31%) samples, Proteus in 36 (7.8%) samples, Pseudomonas in 15 (3.27%) samples and Citrobacter in 8 (1.74%) samples.

CONCLUSION: Seventy three percent of samples showed significant growth. High yield of positive cultures showed good clinical co-relation in suspected cases of UTI. Organisms isolated in urine cultures were gram negative rods. Study proves that pathogens causing urinary tract infections are developing resistance against commonly used antibiotics.

KEY WORDS: Urinary tract infection, Antibiotics, micro-organisms, sensitivity bacteriuria.

INTRODUCTION

Urinary tract infection is not only common nosocomial infection but an important source of morbidity in community as well [1,2]. It is the most frequent cause of illness in humans after respiratory tract infection [3]. It has been observed that E. Coli is the sole causative agent in more than 80% of uncomplicated UTI [4]. Main cause of urinary tract infection is obstruction of urinary tract including stone disease, pelvi-ureteric junction obstruction, benign prostate hyperplasia, vesico-ureteric reflux, urethral strictures and neuropathic bladder [5]. Untreated, maltreated or recurrent infections lead to renal failure. Presence of catheters and stents also develop urinary tract infection in significant number of patients. Urinalysis only indicates presence of bacteria and leucocytes in the urine, which is indirect evidence of UTI but it can only be confirmed on the basis of microscopy and microbial culture [6]. Various virulence factors in uropathogens including adhesisns, hemolysin, capsular polysachride and drug resistance are major decisive factor in development and treatment of infections [7].

As many of urological admitted patients do have either catheters or partial or complete obstruction at different level, they either have already had or susceptible to develop infection during hospital stay. Therefore this is imperative to start antibiotics in almost all cases with empiric treatment before final results are available. To ensure appropriate therapy, current knowledge of the organisms that cause UTI and their antibiotic susceptibility is mandatory [8]. There are various reports available about changing pattern of pathogen and their susceptibility to routinely used antibiotics in last two decades due to extra chromosomal genetic elements, which simultaneously carry gene for resistance to number of antibiotics and this has made the situation miserable, especially in gram negative bacteria [9]. Therefore this is warranted to update the information about rapidly changing sensitivity pattern of micro-organisms towards antibiotics in UTIs, specifically in hospitalized patients. Liaquat University Hospital is one of the largest hospitals of Sindh, with strength of 1600 beds. Department f Urology is providing comprehensive services for stone disease, benign prostatic hyperplasia, urological malignancies, infections, trauma and other problems.

This study is aimed to determine pattern of pathogens isolated and their resistance and sensitivity to different

antibiotics at Liaquat University Hospital so that the clinicians may suggest more appropriate treatment regime at initial stage in benefit of patient as well.

MATERIAL AND METHODS

This study was conducted at Department of Urology at Liaquat University Hospital Jamshoro, Sindh - Pakistan from 1st January to 31st December 2011. Out of all patients admitted for different urological diseases only those who had suspected UTI were included in the study. Suspicion of UTI was made on the basis of urinary symptoms, fever, purulent urine or hematuria. Their urine samples were sent to Diagnostic and Research Laboratory working under supervision of qualified microbiologist. Specimen was collected by standard "clean catch" mid stream method in patients who had no catheter in place, while in catheterized patients, sample was collected in sterile, screw capped, wide mouth container after clamping the catheter for 30 minutes. Before collecting the sample, male subjects were asked to clean the genital part with soap and water while female patients were told to do the genital toilet using soap and water and the vulva was washed and the labia was carefully separated prior to voiding the urine in sterile bottle. Samples were tested for presence of white blood cells and cast. Samples were examined and processed on the blood agar and Mckonkey's medium by standard loop method and incubated for atleast 24 hours at 37^0C. Plates were observed for bacterial growth. Culture results were interpreted as significant and insignificant according to standard i.e. A growth of $\geq 10^5$ CFU/ml was labelled as significant bacteriuria.

Antibiotic susceptibility test of antibiotics and their interpretation was carried out for bacterial isolates by Kirby Baur technique. Uropathogens were identified on the basis of Gram's reaction, colony morphology and standard biochemical tests. Antibiotic susceptibility was tested by disc diffusion method for all 1st and 2nd line antibiotics. First line antibiotics tested were Ampicillin, Cephalexin, cotrimoxazole, Fosfomycin, Amakicin, Gentamicin, Nalidixic acid and Norfloxacin. Second line antibiotics tested were Ciprofloxacin, Ceftazidime, Ceftriaxone and Piperacillin. SPSS version 16 was used to analyze the data.

RESULTS

Out of all admitted patients urine samples of 458 patients who had suspected UTI were sent. Mean age of the patients was 35 years with range of 14 to 90 years. Out of 458 patients, males were 295 (64.5%) and females were 163 (35.5%). Out of 458, positive cultures were 335 (73.14%) on the basis of significant bacteriuria most frequently presented by 41-60 years aged cases (136, 29.65) as detailed in **Table I**. Insignificant growth was found in 23 (5%) samples and no growth was found in 100 (22%) patients. Ninety Nine (21.61%) samples were taken from catheterized and 359 (78.39) were from non-catheterized patients. Escherichia Coli, Klebseilla and Enterobacter were commonest pathogen found from catheterized and non-catheterized patients as detailed in **Table II**. None of the report showed mixed growth.

The maximum susceptibility was for Amikacin (90.83%) for all pathogens and least was for Cephalexin (43.6%). E.coli and Klebsiella SPP were most sensitive to Amakicin i.e. 95% and 84% respectively. The detailed susceptibilities/sensitivities observed are presented by Table no. 3.

TABLE I: AGE AND SEX DISTRIBUTION OF THE CULTURE POSITIVE URINE SAMPLES

Age (in years)	Male	Female	Total
1-15	61	27	88 (19.21%)
16-40	80	45	125 (27.3%)
41-60	81	55	136 (29.69%)
Above 60	73	36	109 (23.79%)

TABLE II: UROPATHOGENS ISOLATED FROM URINE SAMPLE OF CATHETERIZED AND NON-CATHETERIZED PATIENTS

Micro-organisms	Catheter-ized	Non-catheter-ized	Total
E. Coli	33 (11.11%)	264 (88.88%)	297 (64.41%)
Klebseilla spp	24 (47.06%)	27 (52.94%)	51 (11.31%)
Enterobacter	22 (43.14%)	29 (56.86%)	51 (11.31%)
Proteus mirabilis	9 (25.0%)	27 (75.0%)	36 (7.86%)
Citrobacter	4 (50%)	4 (50%)	8 (1.74%)
Pseudomonas aeruginosa	7 (46.67%)	8 (53.33%)	15 (3.27%)

TABLE III: PATHOGENS ISOLATED FROM URINE SAMPLES AND THEIR SUSCEPTIBILITY PATTERN ANTIBIOTIC SUSCEPTIBILITY (%)

Isolated Organisms	No(%) n=458	Amp	Cpx	Gm	Amk	Fos	NA	Nfn	Cmz	Cfx	Cfz	Cft	Ppc
E. Coli	297 (64.41)	65	65	85	95	85	68	66	75	70	80	80	-
Klebseilla	51 (11.31)	32	10	65	84	80	54	5	30	63	70	69	-
Enterobacter	51 (11.31)	36	12	76	86	83	57	6	34	61	72	70	99
Proteus	36 (7.86%)	55	48	72	88	76	50	14	57	75	66	65	-
Citrobacter	8 (1.74)	60	60	84	95	80	54	28	43	88	68	67	100
Pseudomonas	15 (3.27)	45	66	83	97	66	-	-	-	79	97	87	100
Mean susceptibility		48.8	43.6	77.5	90.83	78.3	56.6	23.8	47.8	72.6	75.5	73.0	99.9

First line antibiotics: Amp: Ampicillin; Cpx: cephalexin; Gm: Gentamicin; Amk: Amikacin; Nfx: Norfloxacin; NA: Nalidixic Acid; Cmz: co-Trimoxazole; Cfx: Ciprofloxacin; Cfz: Ceftazidime; Cft: Ceftriaxone; Ppc: Piperacillin

DISCUSSION

Urinary tract infection is one of the significant illnesses that cause burden on national exchequer. Due to widespread and injudicious use of antibiotics at community level we are encountered more and more resistance pattern of micro-organisms to common antibiotics.

Looking at results, significant numbers of young children were affected from UTI, while middle aged (41-60 years) patients had highest incidence of UTI may be due to presence of stone disease in urinary tract, bladder outlet obstruction. Although definitive diagnosis is based on culture results but looking at the significant bacteriuria in 73% of samples shows good clinical co-relation between clinical and microbiological diagnosis as mentioned by Das et al in their study [10].

Presence of insignificant growth or sterile urine may be due to prior use of antibiotics or improper method of collecting samples.

Gram negative bacteria have several properties to attach and invade urothelium in comparison to gram positive pathogens and interestingly in the present study all pathogens isolated were Gram negative rods as mentioned by Yoon et al in which all detected organisms were gram negative [11, 12].

E. coli (64.5%) was the most common isolate found in urine samples found sensitive to 1st line antibiotics, like cotrimoxazole 70%, amoxicillin 65%. There are number of studies in which mentioned about resistance of micro-organisms to conventional antibiotics like ciprofloxacin [13].

In our study 67% of catheterized patients grew non-E.Coli organisms like Klebseilla, Enterobacter and Pseudomonas etc while 72% non-catheterized patients had E. coli in their urine. This shows that presence of catheter develops more resistant pattern of micro-organisms.

Pseudomonas aeruginosa, which is most common cause of hospital-acquired UTI, was less sensitive to quinolones and cephalosporin than aminoglycosides, however number of positive samples for this organism was small [14]. Majority of the Patients who were tested for presence of micro-organisms in their urine came from their home rather than any hospital that could be the reason for small number of patients who had Pseudomonas in their urine.

Klebseilla spp and enterobacter were the 2nd most common isolate found in our study as observed by Bajaj et al [15]. These were also found to be resistant to common antibiotics like amoxicillin and quinolones, cephalosporins. These were sensitive to fosfomycin and aminoglycosides.

In our study pseudomonas was sensitive to Amikacin and Fosfomycin which is also observed by Rizvi et al [16]

In our study mean susceptibility for quinolones was 51% (Ciprofloxacin, Norfloxacin, Nalidixic acid). Among cephalosporins, Ceftazidime and ceftriaxone showed high susceptibility (75%) while cephalexin showed least susceptibility (43%).

This shows that low susceptibility to common 1st line antibiotics is due to widespread use of these antibiotics in community settings as seen by Allen et al [17,18].

Although many of our patients had either stone disease or BPH, this study doesn't aim to differentiate between community and hospital acquired infections.

CONCLUSION

Seventy three percent of samples showed significant growth. High yield of positive cultures showed good clinical co-relation in suspected cases of UTI. Organ-

isms isolated in urine cultures were gram negative rods. Study shows that pathogens causing urinary tract infections are developing resistance against commonly used antibiotics.

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