# Urinary Tract Infection: A Survey of the Prevalent Strains and their Sensitivity

Pages with reference to book, From 259 To 262

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## Abstract

A survey of 1,228 patients was conducted for the evidence of urinary infection by culture and colony count. Of these patients, 50 percent were from the hospital population while the other half were domiciliary. Sixty percent of the ward patients were found to have significant bacterial count as against 35.2 per cent of the domiciliary patients. The commonest organism isolated from the ward patient and domiciliary patient were klebsiella and E. Coli respectively and the strains in the hospital patients were more resistant as compared to non-hospital population (JPMA 31:259, 1981).


## Introduction

Bacterial colonisation of the urinary tract is fairly common in all age groups and both sexes. The symptoms vary from none at all (asymptomatic bacteriuria) to severe endotoxic shock. The clinical diagnosis alone is therefore unreliable and bacterial culture of the urine is the only means of diagnosis (Baily and Scott, 1974).

The collection of midstream urine sample (MSU) in a sterile container is essential for accurate results and inspite of meticulous care certain percentage of margin of error is accepted by all workers (Pfan, 1979). However, presence of organisms in the voided urine does not establish UTI since there is invariable contamination from the normal urethral flora. The presence of infection is only confirmed, if significant bacteriuria, (105 bacteria per ml) is present (Kass, 1956; Cohen and Kass, 1969). It is important to assure that the sample is plated within two hours of voiding. To establish the diagnosis of UTI the urine bacterial count under the rigid criteria laid down is essential. For rapid detection and screening procedures other methods have been developed (Simmons and Williams, 1962; Cohen and Kass, 1969; Bailey and Scott, 1974).

The present study is the analysis of patients seen at the Department of Urology, Mayo Hospital, Lahore, and investigated for UTI. The aim was to establish the frequency of positive urine cultures and study the sensitivity pattern to various commonly used antibiotics in admitted patients and those attending the Urology Out Patient Department.

## Material and Methods

All patients, referred by the staff of the Department of Urology, Mayo Hospital, Lahore, for urine culture have been included in this study. The history, physical examination or microscopy did not influence the patient selection.

Over a period of 8 months, a total of 1512 urine specimens were submitted for culture. All specimens collected by midstream clean catch method in specially sterile tubes were immediately processed. The Dilution-Pour Palate method was used to identify significant bacteriuria. Bacterial counts of over $10^5$ were taken as positive for UTI. The bacteria were identified visually, and sensitivity tested by the Disk Diffusion method (Kunin, 1979).

The zone size of inhibition around an antibiotic disc was used as a measure of the inherent

susceptibility of. the test isolate, other factors influencing the size of the zone were carefully held constant.
These included the type of medium for sensitivity testing, variation in pH, peptone, dextrose content, electrolyte concentration and divalent and multivalent cations which are all known to cause considerable variation in diffusion zone sizes. Wellcome sensitivity test agar, free of sulfonamide antagonists was used in this study for testing of all antibiotics.
Inoculum size: heavy inoculum give high MIC's and smaller zone sizes. This was particularly true of penicillinase producing staphylococcus when tested with penicillinase suspec-tible to penicillin like ampicillin. The inoculum was regulated by comparison with the Kirby- Bauer method of turbidity standard.
Instability of antibiotics: prolonged incubation of cultures containing labile antibiotics increase the apparent resistance of an organism. Thus all sensitivity test plates were incubated overnight and checked after 18 hours of incubation even on holidays.
Care was taken that there was no variation in medium depth and agar content. All 15 cm plates received a melted agar content of 20 ml and it was seen that there were no 'thinner' plates with lower agar content.

**Results**

A total of 1128 patients were included in this study and 1,512 urine samples were processed. Of the total patients there were almost equal number of ward and domiciliary patients. Sixty per cent of ward patients were found to have significant bacterial counts as compared to 35.2 per cent of the domiciliary group (Table I).

Table I

Analysis of Type of Patients Investigated

| *Patients* | *Total Tested* | *Infected* | |
|---|---|---|---|
| | | *No.* | *%* |
| Admitted | 603 | 362 | 60.0 |
| Domiciliary | 625 | 220 | 35.2 |
| Total | 1228 | 582 | 47.4 |

The total urine samples also gave similar results (Table II).

## Table II

### Origin of Urine Specimens Checked for Bacterial Count

| *Patients* | *Total No. of Specimens* | *Positive* | |
|---|---|---|---|
| | | *No.* | *%* |
| Admitted | 737 | 430 | 58.3 |
| Domiciliary | 775 | 269 | 34.7 |
| Total | 1512 | 699 | 46.2 |

In a total of 699 positive urine cultures, the organisms were isolated and identified. In a number of specimens, particularly the ward patients, multiple organisms were found. Klebsiella was the commonest organism in ward patients and E. coli in the domiciliary cases (Table III and IV).

## Table III

**Type of Organisms Isolated from Urine Samples of Admitted Patients**

| *Type of Organisms* | *Number* | *% of Total Isolates* |
|---|---|---|
| Klebsiella | 188 | 38.7 |
| *E. coli* | 167 | 34.4 |
| Pseudomonas | 93 | 19.1 |
| Proteus | 31 | 6.4 |
| Streptococci and others | 7 | 1.4 |
| Total | 486 | 100.00 |

## Table IV

### Type of Organisms Isolated from Urine Samples of Domiciliary Patients

| *Type of Organisms* | *Number* | *% of Total Isolates* |
|---|---|---|
| *E. coli* | 180 | 37.3 |
| Klebsiella | 166 | 34.4 |
| Pseudomonas | 99 | 20.5 |
| Staphylococci | 17 | 3.5 |
| Streptococci and Others | 17 | 3.5 |
| Proteus | 4 | 0.8 |
| Total | 483 | 100.00 |

The sensitivity pattern of the bacterial growth of the two groups of patients is shown in (Table V and VI).

## Table V

### Drug Sensitivity Pattern in Bacteria Isolated from Admitted Patients

| *Antibiotics* | *Percentage of Sensitivity* | | | |
|---|---|---|---|---|
| | *E. coli* | *Klebsiella* | *Pseudo-monas* | *Proteus* |
| 1. Amoxicillin | 14.28 | 13.04 | 12.50 | 11.11 |
| 2. Ampicillin | 7.61 | 11.11 | 11.11 | 00.00 |
| 3. Ampiclox | 29.35 | 26.00 | 00.00 | 00.00 |
| 4. Carbenicillin | 10.81 | 16.97 | 13.04 | 33.33 |
| 5. Co-trimexazol | 11.43 | 17.50 | 11.11 | 12.50 |
| 6. Erythromycin | 15.30 | 17.07 | 10.00 | 14.28 |
| 7. Furadantin | 87.80 | 83.33 | 33.33 | 75.00 |
| 8. Gentamicin | 95.12 | 80.00 | 34.23 | 56.66 |
| 9. Kanamycin | 37.77 | 32.00 | 40.47 | 33.33 |
| 10. Kanacillin | 34.09 | 24.00 | 37.50 | 33.33 |
| 11. Minocin | 73.33 | 69.56 | 40.00 | 100.00 |
| 12. Nalidixic Acid | 97.61 | 86.66 | 55.55 | 77.77 |
| 13. Phenithecillin | 2.32 | 0.00 | 00.00 | 00.00 |
| 14. Stretpomycin | 16.66 | 22.22 | 10.00 | 20.00 |
| 15. Tetracyclin | 00.00 | 11.76 | 10.00 | 25.00 |
| 16. Vibramycin | 62.17 | 52.08 | 45.00 | 42.85 |

## Table VI

**Drug Sensitivity Pattern of the Organisms Isolated from Domiciliary Patients**

| *Antibiotics* | *Percentage of Drug Sensitivity* | | |
|---|---|---|---|
| | *E. coli* | *Klebsiella* | *Pseudo-monas* |
| 1. Amoxicillin | 34.78 | 31.14 | 19.04 |
| 2. Ampicillin | 27.27 | 22.22 | 00.00 |
| 3. Ampiclox | 15.45 | 27.27 | 12.50 |
| 4. Carbenicillin | 40.80 | 33.33 | 48.14 |
| 5. Co-trimexazol | 16.27 | 22.22 | 42.30 |
| 6. Erythromycin | 35.00 | 16.12 | 08.09 |
| 7. Furadantin | 82.97 | 67.64 | 17.65 |
| 8. Gentamicin | 97.90 | 79.48 | 97.73 |
| 9. Kanamycin | 66.66 | 48.93 | 51.52 |
| 10. Kanacillin | 58.32 | 44.44 | 46.42 |
| 11. Minocin | 56.25 | 60.71 | 31.25 |
| 12. Nalidixic acid | 83.33 | 90.24 | 27.27 |
| 13. Phenithecillin | 10.63 | 05.40 | 09.09 |
| 14. Streptomycin | 35.71 | 50.00 | 18.18 |
| 15. Tetracyclin | 18.18 | 16.66 | 18.18 |
| 16. Vibramycin | 65.78 | 54.20 | 50.00 |

The ward urine specimens showed a high degree of resistance as compared to the domiciliary cases.

**Discussion**

Urinary tract infection (UTI) is a common problem all over the world. However, a clear understanding of bacterial colonisation and growth in the urinary tract is now emerging. The significance of asymptomatic bacteriuria cystitis and pyelonephritis are under extensive investigation. The role of antibiotics and the problem of recurrent infection, are being explored in the light of new data generated. In Pakistan UTI is not considered as a significant problem. Presence of pus cells on microscopy is

considered sufficient grounds for antibiotic therapy. The abuse of antibiotics in hospital population is not infrequent. The facilities for proper collection of the specimen and culture to assess significant bacteriuria (10s) are difficult to attain.

The patient population in this study was highly mixed. The upper and lower urinary tract localisation was not attempted. Infection secondary to stones, congenital defects or instrumentation was not identified. However, this study has shown certain important markers for future work in this field.

The percentage of infected cases in the hospitalised patients was significantly higher than the domiciliary group (Tables I and II). This signifies the initial urinary tract disease requiring admission and patients with long history of catheterisation. However, we can not ignore nosocomial infection. The latter is clearly shown by the difference in the organisms isolated in two groups (Table III and IV). The preponderance of Klebsiella in hospitalised patients as compared to E. coli in the domiciliary group is significant. This indicates cross infection in the operation theater and the wards. The high incidence of Klebsiella in the domiciliary group perhaps reflects the frequency of persistant infection in the patients discharged from the ward.

The sensitivity pattern shown in the two groups is rather unique. The highly resistant strain of E. coli and Klebsiella in the admitted patients is significant. The discs used to determine the antibiotic sensitivity were checked by comparing the results obtained with the disc made in the laboratory using different concentrations of antibiotics. It appears that E. coli and Klebsiella strains isolated from the urinary tract of hospital population are highly selected strains with a remarkable resistance to most of the antibiotics. Indiscriminate use of antibiotics in hospitals has selected a particular strain in the working environment and has disturbed the ecological balance.

The type of organisms in UTI and their sensitivity varies with the geographical location. A study by Ahmed and associates (1975) from Karachi has shown that Klebsiella is a rare organism in patients with UTI symptoms. The drug sensitivity is also markedly different from patients reported here.

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