Bacteriological profile in UTI Cases with special reference to Amikacin sensitivity in a tertiary Care centre in Western UP

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Abstract

Introduction: UTI is the most common bacterial infection worldwide with women in reproductive age group being 30 times more likely to suffer from it than men due to short urethra and proximity of uretheral opening with anal canal. *Escherichia coli* is the most common organism responsible for UTI and there has been an increase in incidence of community acquired UTI caused by ESBL producing *E. coli*. This study was planned to see the sensitivity of amikacin in urinary isolates so it can be considered as a treatment option in ESBL producing organisms, reserving high-end drugs like carbapenems.

Materials and Methods: The retrospective study was carried out between January 2017 to August 2017 with 1025 patients of suspected UTI being screened for growth of bacteria in their urine samples and their sensitivity to antibiotics. Both males and females were included in the study, ages ranging from 0 year to >80 yrs. Urine samples were inoculated on Blood agar and MacConkey agar. All positive cultures were tested for antibiotic susceptibility testing by Kirby bauer disc diffusion technique.

Results: Out of total 1025 samples, growth was detected in 171 (16.7%) samples. Out of these 121 (70.8%) were females, and 50 (29.2%) were males. Maximum number of males are seen in age group 21-30yrs i.e. 13 (26%) followed by 41 to 50yrs i.e. 12 (24%). Also, maximum number of females are seen in age group 21-30yrs i.e. 41 (33.9%) followed by 21 (17.4%) patients in age group 41-50yrs. Most common microbial agent isolated was *Esch.coli* (97/171), followed by *Klebsiella* spp. (25/171). The important finding of the study was the sensitivity pattern of amikacin which was found to be sensitive in 61% of the isolates which is quite significant and we can use amikacin rather than high end antibiotics like carbapenems in these cases of UTI which will prevent emergence of resistance against them.

Conclusion: Our finding i.e. Amikacin being highly sensitive to urinary pathogens reflects upon the facts that in sensitive cases, Amikacin can be used for ESBL producing uropathogens instead of costly high end antibiotics like Carbapenams.

Keywords: UTI, ESBL producing *E. coli*, Amikacin.

Introduction

UTI is the cause of major share of patients presenting to physicians and also the reason of maximum number of urine samples received in microbiology laboratory for culture and sensitivity.[1] In general, females are affected more than males and almost 40% of women develop UTI at some point in their life. Adult women are 30 times more likely than men to develop a UTI, with almost half of them experiencing at least one episode of UTI during their lifetime.[2] because of short urethra, close proximity to anus and sexual activity. Other susceptible adults include the elderly and patients requiring urethral catheterization. Amongst all the gram negative bacilli and gram positive cocci causing UTI, *E. coli* is the most common cause of UTI worldwide,[3,4] and there has been an increase in the incidence of community acquired UTI caused by ESBL producing *Esch.coli*.[5,6] The treatment options for such ESBL producing *Esch.coli*[7] are very limited especially in outpatient settings as ESBL are enzymes which cause degradation of most of β lactam antibiotics viz. penicillin and cephalosporins. Carbapenems are the drug of choice for infections caused by ESBL producing pathogens however there are a host of drawbacks associated with carbapenems viz high cost, hospitalization required (except for ertapenem) and development of resistance against them by their frequent usage. Other options include combination of β lactam and β lactamase inhibitor, 4th generation cephalosporins, tigecycline, nitrofurantoin, fosfomycin etc.

Over the last decade there has been a renewed interest in the therapeutic role of aminoglycosides viz amikacin in the treatment of mild to moderate UTI caused by ESBL producing *Esch.coli*. Amikacin definitely shows good in vitro sensitivity in ESBL positive organisms[8] and it attains a high concentration in urine so therapeutic value is promising in treatment of UTI. Also low cost and once daily dosing make it a good treatment option for pathogens showing sensitivity to amikacin causing mild to severe UTI. The only limiting factor in usage of amikacin is its nephrotoxicity and ototoxicity for which the patients have to be closely monitored for renal parameters and auditory symptoms. There have been studies on amikacin OPAT (outpatient parenteral antibiotic therapy) in children and females suffering from UTI and they show promising results.[9]

This study was planned keeping in mind that ESBL producing Esch.coli and GNBs causing UTI are on a rise and so an estimate of amikacin sensitivity in this area could guide treatment for such cases and instead of carbapenams, amikacin can be used in such patients.

This way we can reserve carbapenems for severe cases and also prevent development of resistance against it.

Materials and Methods

This retrospective study was conducted in a peripheral tertiary health care centre in UP and data on urine culture and sensitivity was collected from January 2017 to August 2017. Information on microorganisms isolated from urine samples of suspected UTI patients who had presented to OPD with sign and symptoms of UTI viz. fever, frequency, burning micturition was collected and analyzed. The patients admitted in wards that were either admitted for the UTI symptoms or for some other condition but developed UTI in course of time were also included in the study.

The urine samples were processed according to standard guidelines.[10] The urine samples were inoculated on Blood agar and MacConkey agar by the semi quantitative plating method using the calibrated loop technique (0.001 ml). After 18-24 hours of aerobic incubation, the growth was subjected to identification of the organism by standard biochemicals and antibiotic sensitivity testing was done by Kirby bauer disc diffusion technique according to CDC guidelines .Urine culture reports were carefully collected, observed and analyzed for the organism isolated, its sensitivity pattern to various antibiotics besides the demographic data. Patients from all age groups, sex with symptomatic bacteriuria were included in the study and those patients who had taken antibiotic with in previous 30 days of culture were excluded from the study.

Results

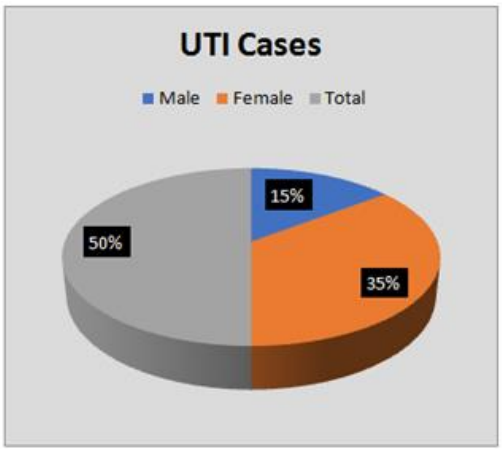
The total number of urine samples received in microbiology lab from January 2017 to August 2017 was 1025, out of which growth was seen in 171 samples (16.7%) table 1.

Table 1: Urine samples showing growth and no growth after culture

S. No.	Particulars	Value
1	Total Cases	1025
2	Growth	171
3	Sterile	854

Out of 171 culture positive cases, females outnumbered males as 121 female samples were culture positive as compared to that of 50 males, Graph 1.

Chart 1: Distribution of growth positive cases with respect to sex



Amongst the culture positive samples maximum number of males were seen in the age group 21 to 30 years i.e. 13/50 (26%) followed by 24% in the 41 to 50 years age group. In females also maximum patients were in the 21 to 30 years age group i.e. 41 out of 121(33.9%) followed by 21 patients out of 121 (17.4%) in the 41-50 year age group. There was no sample from any patient above 80 years of age whereas 2 males and 1 female presented in the 0 to 10 year age group, Graph 2.

Esch.coli was the most common organism isolated 97/171 (56.7%) from the samples followed by *Klebsiella* species 25/171(14.6%). *Staphylococcus aureus* was seen in 15 cases (8.8%) whereas coagulase negative *Staphylococcus*(CONS) species were found in 12 cases (7%). *Enterobacter* species and *Proteus* species were seen in 5 samples each whereas *Pseudomonas* species and *Citrobacter* species was seen in 1.8% samples. *Acinetobacter* was seen in 2 cases whereas *Candida* species were seen in 4 samples Table 2.

Chart 2: Distribution of growth positive cases with respect to age and gender

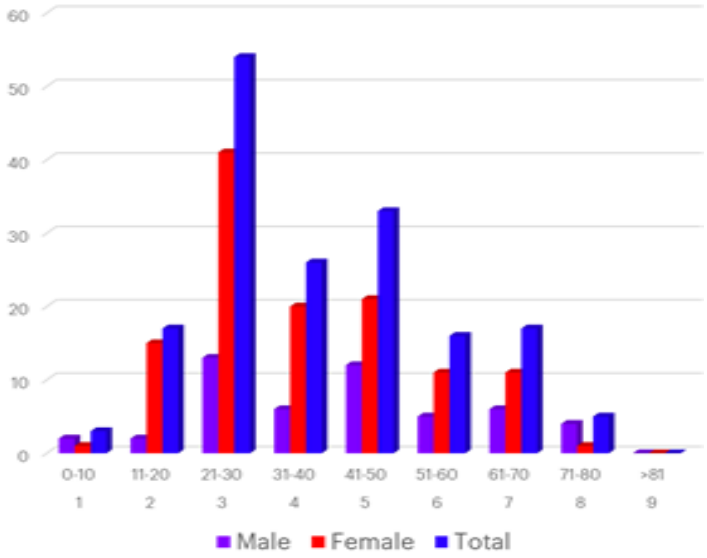
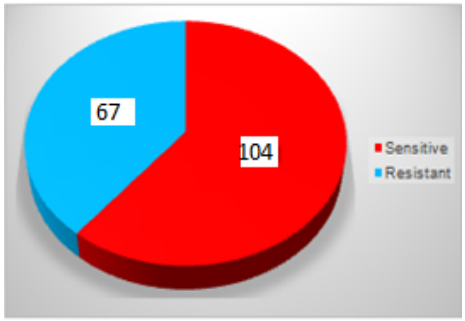


Table 2: Spectrum of bacterial isolates obtained from culture positive cases

S. No.	Particular	Value
1	Esch.coli	97
2	Klebsiella	25
3	Pseudomonas	3
4	Citrobacter	3
5	CONS	12
6	S.Aureus	15
7	Acinetobacter	2
8	Enterobacter	5
9	Proteus	5
10	Candida Spp.	4

During antimicrobial susceptibility testing, amikacin was found to be sensitive in 104 out of 171 cases (61%) whereas gentamicin was found to be sensitive in 26% cases, Graph 3.

Graph 3: Sensitivity pattern of organisms to Amikacin



Discussion

More number of females as compared to males suffering from UTI as we found in our study have also been seen in studies by Harish et al and Subedi et al.[11,12] Subedi et al found in their study that 84.8% of total cases of UTI were females while our study shows that 71% of cases were from female population. The most probable reason for the above findings is short urethra and its close proximity to anus which makes them more vulnerable to UTI.

Maximum number of males (26%) and females (33.9%) falling in 21-30 years age group coincides with the study of Subedi et al and Harish et al.[11,12] Harish et al stated in their study that 38.29% of patients were in the 21-29 year age group while our study shows 31.6% (54/171) patients in the same age group. The reason for above findings could be increased physical and sexual activity in this age group.

The distribution of organisms recovered from UTI cases confirms with the study of Beyene et al. Their study reveals Esch.coli was isolated from 50% culture positive cases while our study shows 56.7% isolation of Esch.coli from urine samples of UTI patients.[13] Our study shows amikacin sensitivity to be 104/171 (60.8%) which is much in agreement with study of R nalini et al[14] whose study depicts amikacin sensitivity to be 66.5% and reflects. A study by Shalini et al shows amikacin sensitivity at a good 98.9% which reflects presence of good treatment options apart from carbapenems[15].The study by Singhal et al[16] shows amikacin sensitivity to be 72% in IPD patients while 89% in OPD patients. Overall amikacin is still a much countable option in treatment of UTI caused by ESBL producing Esch.coli.

The mechanism of action of amikacin, its pharmacokinetic and pharmacodynamic make ita relevant substitute for carbapenams. An animal study shows that urine concentration of amikacin remains above MIC for approx 4 days after the last dose and so then is considerable post antibiotic coverage.

Conclusion

The magnitude of problem of incidence of UTI, developing resistance in microorganisms causing UTI and changes in sensitivity patterns of microorganisms towards antibiotics causes this issue to be looked upon time and again. Need for timely revision of antibiotic sensitivity pattern and empirical therapy of UTI according to the current behavior of microorganisms is ever dwelling. Age old drug like amikacin presents a good treatment option for mild to moderate UTI cases caused by ESBL producing uropathogens. Since no new molecules are seen coming in near future, judicious use of existing drugs is the best way to navigate the current situation.

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