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Microbiology

KEY WORDS: Antibiotic sensitivity test, uropathogen, Urinary tract infection

STUDY OF UROPATHOGENS AND ANTIBIOTIC SUSCEPTIBILITY IN CASES OF URINARY TRACT INFECTIONS (UTI) IN RAMA MEDICAL COLLEGE AND HOSPITAL, HAPUR.

Dr. Muzaffari Yasmeen Associate Professor, Department Of Microbiology, Rama Medical College, Hapur.

Dr. Md Rashid Taj* Associate Professor, Department Of General Medicine, Rama Medical College, Hapur. *Corresponding Author

ABSTRACT

Background: One of the most common infectious diseases diagnosed in developing countries is urinary tract infection (UTI). extensive exercise of antibiotics in opposition to uropathogens has led to the appearance of antibiotic resistant. A laboratory based cross-sectional survey was conducted in Rama Medical College and Hospital to determine the prevalence and antibiotic susceptibility of uropathogens in hapur district .

Methods: We have collected 101 clean catch mid-stream urine samples from all suspected UTI using sterile screw capped container. The urine samples were cultured and processed for subsequent uropathogens isolation. The identified species were then exposed to selected antibiotics to test for their susceptibility.

Results: The overall prevalence of urinary tract infection in the area was 60.39%. Most frequently isolated uropathogen in our study was *Escherichia coli* was the most prevalent bacterial uropathogen with 21/61 (34.5%) followed by *Staphylococcus aureus* 16/61 (26.2%), *Klebsiella pneumoniae* 12/61 (19.6%), *Proteus mirabilis* 1/61 (1.2%), *Enterococcus faecalis* 6/61(9.8%), and *Proteus aeruginosa 2/61* (3.2%). *Escherichia coli* was mostly sensitive to Meropenam and Cefuroxime 17/21 (80.96%), *Staphylococcus aureus* highest sensitivity to piperacillin/tazobactam 14/16 (87.5%) . Sensitivity of *Klebsiella pneumonia* was good with most of the anti biotics with best result of gatifloxacin 11/12 (91.67%). *Enterococcus faecalis* was sensitive to almost all the antibiotics having 100% sensitivity to antibiotics like vancomycin, meropenam and piperacillin/tazobactam.

Conclusion: The option of empirical antimicrobial treatment is notably affected by uropathogen prevalences according to age and gender .judicious use of antibiotic is important.

INTRODUCTION

Urinary tract infections (UTIs) are among the frequent bacterial infections worldwide. Although women, particularly those aged 16–64 years, are appreciably more likely to experience UTIs than men, urinary infections repeatedly occur in both genders and across all age groups explicit populations such as pregnant women, the elderly or patients with spinal cord injuries, catheters, or diabetes are also at increased risk.Empiric antibiotic treatment is therefore commonly adopted. However, due to noteworthy local differences in incidence of urinary agents, the coming out of new pathogens and changes of antimicrobial resistance, periodic assessment of pathogens epidemiology is suggested, in order to revise treatment advices. Since essential host factors may involve urinary aetiology and antibiotic susceptibility, particular patients groups should be investigated in more detail. The diagnosis of UTI relies on the presence of significant bacteriuria in clean catch samples of adequately collected quantitative urine cultures. Community acquired urinary tract infection (CA-UTI); defined as an infection of the urinary tract that occurs in the community or within less than 48 hours of hospital admission and was not incubating at the time of hospital admission. According to estimation, about 150 million reports of urinary tract infections (UTIs) per annum were recorded worldwide and about 35% of those were of nosocomial origin. In the limit of course, the UTI problem has been magnified over the time with the emergence of multidrug resistant (MDR) bacteria and it has become a frequently met with medical problem. It is most often caused due to bacteria, but may also include fungal and viral infections. Gram-negative bacteria cause 90% of UTI cases while gram-positive bacteria cause only 10% of the cases. Paradigmatically, the transformation of the commensal, *Escherichia coli (E. coli)* mostly isolated from patients with uncomplicated UTI, to be a notorious pathogen is of utmost consternation. Further, several other Gram-negative notorious UTI-bacteria are mainly *Acinetobacter baumannii* (*A. baumannii*), *Pseudomonas aeruginosa* (*P. aeruginosa*), *Proteus* sp., *Klebsiella* sp., *Chlamydia trachomatis* and *Neisseria gonorrhea*. Moreover, UTI-fungi, *Candida* sp. (such as *Candida albicans, Candida utilis, Candida glabrata, Candida tropicalis, Candida kefyr* and *Candida guilliermondii*) and *Rhodotorula* sp., often burgeon in the mazed environment of infection-source in a hospital, promoting UTI. The appearance of antibiotic resistance in the management of UTIs is a serious public health issue. Mainly in the developing world where there is high level of poverty, illiteracy and poor hygienic practices.

MATERIALS AND METHODS

Data and sample collection: This was a cross-sectional study that was conducted in Rama Medical College and hospital from August 2018 till August 2019. Patient presented with symptoms of UTI. Upon completion of the management plan. After the consent from participation. Individuals who consented were asked to fill in an interviewer administered questionnaire which was directed at demographic information, symptoms of UTI and host-associated factors for CA-UTI. We collected 101 midstream urine samples from 101 participants The study included individuals above 18 yrs of age who presented to Rama Medical College with symptoms suggestive of UTI including; lower abdominal or flank pain, dysuria and hematuria, urgency, frequency, hesitance, and consented to be part of the study. Culture and sensitivity was done. Sensitivity tests were done using the appropriate media and agar, following the commercial disc use for the antibiotics sensitivity test.

Culture: Using a calibrated loop, 1ml of the MSU was inoculated onto MacConkey agar with crystal violet and 5% sheep blood agar and Cystine Lactose Electrolyte Deficient (CLED) agar. CLED was used as it gives consistent results and allows the growth of both gram negative and gram positive bacterial pathogens, and it also prevents the swarming of Proteus species.

Data Analysis: All the raw data from questionnaires and microbiology analysis was recorded into a database generated using Epidata version 3.1 and then transferred to STATA version 12 for analysis. Numeric data was summarized using measures of central tendency while the categorical data was summarized using proportions and percentages.

Comparisons were made between participants who had UTI and those who had no UTI.

RESULTS

Table 1: Age-specific prevalence of bacterial uro pathogens.

Age range	Positive UTI (%)	Negative UTI (%)	Total (%)
18-28	18	08	26
29-38	10	07	17
39-48	10	09	19
49-58	08	06	14
>59	15	10	25
Total	61	40	101

One hundread and one (101) morning clean catch midstream urine samples were collected from patients attending our hospital. Significant bacteriuria was observed in 61/101 (60.39%). Prevalence of bacterial UTI was highest in the age group 18-29 with 18/61 (29.50%).

Table 2: Prevalence of bacterial uropathogen isolates from MSU.

Uropathogens	Male, *n* (%)	Female, *n* (%)	Total, *n* (%)
E. coli	6	15	21
S. aureus	4	12	16
K. pneumonia	4	8	12
P. mirabilis	0	1	1
A. baumannii	1	2	3
P. aeruginosa	1	1	2
E. faecalis	4	2	6
Total	20	41	61

Urinary tract infection was maximum in females with 41/61 as compared to 20/61 in men. *Escherichia coli* was the most prevalent bacterial uropathogen with 21/61 (34.5%) followed by *Staphylococcus aureus* 16/61 (26.2%), *Klebsiella pneumoniae* 12/61 (19.6%), *Proteus mirabilis* 1/61 (1.2%), *Enterococcus faecalis* 6/61(9.8%), and *Proteus aeruginosa 2/61* (3.2%).

Table 3. Antibiotic sensitivity patterns of the organisms isolated in the pure bacterial growths.

Drug	*Escherichia coli*	*Staphylococcus aureus*	*Klebsiella pneumoniae*	*Enterococcus faecalis*
Nitrofurantoin	12/21	-	8/12	-
Erythromycin	-	10/16	7/12	3/6
Levofloxacin	4/21	5/16	8/12	4/6
Meropenam	17/21	9/16	10/12	6/6
Vancomycin	-	11/16	-	6/6
Gatifloxacin	7/21	8/16	11/12	4/6
Gentamycin	9/21	9/16	8/12	4/6
Piperacillin/tazobactam	12/21	14/16	9/12	6/6
Augmentin	10/21	6/16	8/12	5/6
Cefuroxime	17/21	7/16	10/12	5/6
Ceftriaxone	3/21	1/16	2/12	4/6
Amikacin	2/21	2/16	3/12	3/6
Ampicillin	7/21	4/16	8/12	4/6

The commonest uropathogen isolated was *Escherichia coli* at and the organism was mostly sensitive to Meropenam and Cefuroxime 17/21 (80.96%), antibiotic like ceftrixone 3/21(14.28%) and tetracycline 2/21 (9.52%) was having high resistance . *Staphylococcus aureus* was second most common organism found with The highest sensitivity to piperacillin/tazobactam 14/16 (87.5%) and highly resistance to ceftrioxone 1/16 (6.25%). sensitivity of *Klebsiella pneumonia* was good with most of the anti biotics with best result of gatifloxacin 11/12 (91.67%) but ceftrioxone 2/12 (16.66%) and amikacin 3/12 (25%) is not the good choice. *Enterococcus faecalis* was sensitive to almost all the antibiotics having 100% sensitivity to antibiotics like vancomycin, meropenam and piperacillin/tazobactam.

DISCUSSION

In our study the overall prevalence of UTI was 60.39%. In accordance with *Haque R et al* and *Ayoade F et al* .the prevalence of UTI is higher in females (67.2%) than males (32.8%)

(Table 2). This might be due to the anatomical differences of urogenital organs between the two sexes . Prevalence difference has been also observed among different age groups. This difference suggests that age is one risk factor linked with UTI. The elevated incidence of UTI among the old age group could be due to genito-urinary shrivel and vaginal prolapsed increasing vaginal pH and decreasing vaginal Lactobacillus increase the chance of uropathogens .Moreover, it was indicated in study *Nicolle LE* and *Shortliffe LM et al* that UTI is the most common infection in elderly populations. The high prevalence recorded amongst young age group could be due to increased sexual activity in the age group. Bacteria were the more prevalent uropathogens In the urianary positive sample. Amongst the isolates bacteria the prevalence of E. coli (34.5%) in the current study is comparable with that reported from Nigeria, Zaria by but higher than the reports of *Monali Priyadarsini Mishra et al* study conducted in Odisha from Pakistan and from Mekele hospital, Ethiopia .

Staphylococcus aureus was the second most isolated bacterial uropathogen with 16/61 (26.22%) of frequency. high frequency of *S.aureus* in UTI also seen in Earlier studies in Bushenyi (Uganda) 2015, and Awka (Nigeria) 2016 reported high rates of *S. aureus* of 45/103 (43.7%), and 60/215 (28%), respectively. However, the separation of *Klebsiella pneumoniae* 12/61 (19.6%), is in conformity with other studies by Baguma et al.

other isolates in this study is *Enterococcus faecalis* 6/61 (9.8%) which is similar with other studies done by Khanal et al. in Nepal and Lo et al. in São Paulo Brazil. Escherichia coli which was the commonest uropathogen isolated showed generally high sensitivity to sensitive to Meropenam and Cefuroxime 17/21 (80.96%) our study is accordance with study of Érique José Peixoto De Miranda and reduced sensitivity to ceftrixone 3/21(14.28%) and tetracycline 2/21 (9.52%). *Staphylococcus aureus* the second most common uropathogen isolated showed high sensitivity to highest sensitivity to piperacillin/tazobactam 14/16 (87.5%). Nomura S et al also found against all beta-lactamase-producing bacteria tested the antibacterial activity of tazobactam-piperacillin was at least 4- to 64-fold stronger than other antibiotics.

CONCLUSION

The option of empirical antimicrobial treatment is notably

affected by uropathogen prevalences according to age and gender . *E. coli* was the most common uropathogen in the cases of community-acquired UTI in our study. Antibiotic sensitivity pattern depend on the use or misuse of the antibiotic in the given geographical area and its varies from one pathogen to other. So selection of primary antibiotic should be done very cautiously.

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