ORIGINAL RESEARCH PAPER

Microbiology

STUDY OF MICROBIAL AGENTS AND THEIR SENSITIVITY PATTERN TO 1ST AND 2ND LINE OF ANTIBIOTICS IN PATIENT WITH URINARY TRACT INFECTION.

KEY WORDS: Antimicrobial Susceptibility, Urine Culture.

Kumar Abhishek Senior Resident Index Medical college Indore.

Sinha Archana Assistant Professor Rama Medical college Ghaziabad. , Senior resident Aiims Patna .

Singh Ruchi* Senior resident Aiims Patna. *Corresponding Author

ABSTRACT

AIM

1. To Study the Microbial Agents including Bacteria & Yeasts Responsible for UTI in Patient attending both OPD and IPD at **Index Medical College Hospital & Research Centre, Indore.**
2. To Study the Antimicrobial Sensitivity Patterns of bacterial Uropathogens.

MATERIAL AND METHODS: Urine samples were collected from patients attending the OPD and IPD. 300 Mid stream urine samples from patient showing presumptive symptoms of UTI were collected taking all aseptic precautions. Urine Analysis,Wet mount preparation, gram staining, isolation on Cled agar, Blood agar, **Leukocyte** esterase AST done by Kirby Bauer method and ESBL detection by double disk method and biochemical reaction was done.

RESULTS: E.coli was the most common uropathogen isolated.Anti microbial susceptibility pattern of E.Coli showed maximum sensitivity to Amikacin 69% and Nafcillin (50%) and maximum resistance was seen with Nitrofuratoin (68%) Peniciline G (67%) .

CONCLUSION: E.coli was the most common cause of UTI in community and hospital and amikacin is an effective drug against it.

INTRODUCTION: Urinary tract infections is a very common infection in both community and hospital patients. Urinary tract infections (UTIs) are some of the most common bacterial infections, affecting 150 million people each year world wide.UTIs are a significant cause of morbidity in infant boys, older men and females of all ages. Serious sequelae include frequent recurrences, pyelonephritis with sepsis, renal damage in young children, pre-term birth and complications caused by frequent antimicrobial use, such as high-level antibiotic resistance and *Clostridium difficile* colitis.T o optimize the use of empirical antibiotics it is important for clinicians to have aknowledge of etiological agents and susceptibility patterns of UTI pathogens in population.

Clinically, UTIs are categorized as uncomplicated or complicated. Uncomplicated UTIs typically affect individuals who are otherwise healthy and have no structural or neurological urinary tract abnormalities[5,6;] these infections are differentiated into lower UTIs (cystitis) and upper UTIs (pyelonephritis) [5,7]. Several risk factors are associated with cystitis, including female gender, a prior UTI, sexual activity, vaginal infection, diabetes, obesity and genetic susceptibility[3,7]. Complicated UTIs are defined as UTIs associated with factors that compromise the urinary tract or host defence, including urinary obstruction, urinary retention caused by neurological disease, immunosuppression, renal failure, renal transplantation, pregnancy and the presence of foreign bodies such as calculi, indwelling catheters or other drainage devices[8,9]. In the United States, 70–80% of complicated UTIs are attributable to indwelling catheters[10], accounting for 1 million cases per year[4]. Risk factors for developing a CAUTI include prolonged catheterization, female gender, older age and diabetes[11].

UTIs are caused by both Gram-negative and Gram-positive bacteria, as well as by certain fungi . The most common causative agent for both uncomplicated and complicated UTIs is uropathogenic *Escherichia coli* (UPEC). For the agents involved in uncomplicated UTIs, UPEC is followed in prevalence by *Klebsiella pneumoniae, Staphylococcus saprophyticus, Enterococcus faecalis,* group B *Streptococcus*(GBS), *Proteus mirabilis, Pseudomonas aeruginosa, Staphylococcus aureus* and *Candida spp.*[3,6,12,13]. For complicated UTIs, the order of prevalence for causative agents, following UPEC as most common, is *Enterococcus spp., K. pneumoniae, Candida* spp., *S. aureus, P. mirabilis, P. aeruginosa* and GBS[9,14–16]

Epidemiology of urinary tract infections

Patients suffering from a symptomatic UTI are commonly treated with antibiotics; these treatments can result in long-term alteration of the normal micro-biota of the vagina and gastrointestinal tract and in the development of multidrug-resistant microorganisms[17]. The availability of niches that are no longer filled by the altered microbiota can increase the risk of colonization with multidrug-resistant uropathogens. Importantly, the 'golden era' of antibiotics is waning, and the need for rationally designed and alternative treatments is therefore increasing. Recent studies have used RNA sequencing to directly analyse uropathogens from the urine of women experiencing symptomatic UTIs. These studies, together with basic science and improved animal models, have been crucial in enabling us to understand the molecular details of how uropathogens adhere, colonize and adapt to the nutritionally limited bladder environment; evade immune surveillance; and persist and disseminate in the urinary tract.

MATERIAL AND METHODS

Exclusion criteria:-

(a) Cases with hypertension
(b) Cases with tuberculosis
(c) Cases with sexually transmitted disease and HIV

Inclusion criteria:-

(a) Patient of all age groups and both sexes.
(b) Symptomatic patient suspecting urinary tract infection.
(b) Catheterized patient.

Sample collection

Clean-Catch sample to obtain an untainted urine sample midstream (**MSU**).

LABORATORY PROCEDURE- sample collection, urine analysis wet mount preparation gram staining, isolation on Cled agar, Blood agar, **leukocyte** esterase AST done by Kirby Bauer method and ESBL detection by double disk method and biochemical reaction was done.For yeast identification direct Koh method, culture-Sabouraud dextrose agar.

Species	Lactose	Gas	Indole	MR	citrate	ppa	urease	H2s
Citrobactor freundi	+/-	+	-	+	+	-	+/-	+/-
Citrobactor koseri	+	+	+	+	+	-	+/-	-
Enteobactor aerogenes	+	+	-	-	+	-	-	-
Enteobactor cloacae	+	+	+	-	_	+	+/-	-
E coli	+	+	+	+	-	-	-	-
Haffnia alvei	-	+	+	-	-	-	-	-
Klebsiella oxyloca	+	+	+	-	+	-	+	-

Klebsiella pneumoniae	+	+	-	-	+	-	+	-
Morganella morganil	-	+	+	+	-	+	+	+/-
Proteus mirabilis	-	+	-	+	+/-	+	+	+
Proteus vulgaris	-	+	+	+	-	+	+	+
Providencia alkalifencies	-	+	+	+	-	+	-	-
Providencia rettgerii	-	+	+	+	-	+	+	-

KIRBY-BAUER ANTIBIOTIC TESTING

KB testing or is a test which uses antibiotic-impregnated wafers to test whether particular bacteria are susceptible to specific antibiotics. A known quantity of bacteria is grown on agar plates in the presence of thin wafers containing relevant antibiotics. If the bacteria are susceptible to a particular antibiotic, an area of clearing surrounds the wafer where bacteria are not capable of growing (called a zone of inhibition).This along with the rate of antibiotic diffusion are used to estimate the bacteria's sensitivity to that particular antibiotic. In general, larger zones correlate with small germanium (MIC) of antibiotic for those bacteria. This information can be used to choose appropriate antibiotics to combat a particular infection.

OBSERVATION AND RESULTS:

CHART (1)-TYPES OF UROPATHOGENIS ORGANISM ISOLATED FROM OUTDOOR

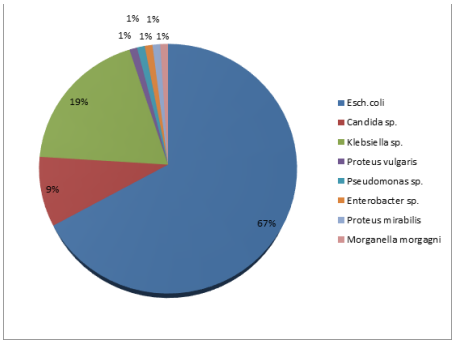

CHART (2)-PROPORTION OF DIABETIC AND NON DIABETIC PATIENTS WHO HAD UTI

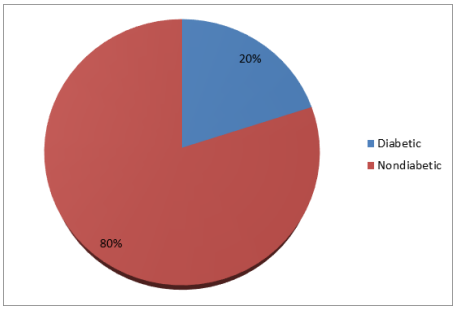

CHART (3)-PROPORTION OF HOSPITALISED PATIENTS WITH AND WITHOUT URINARY CATHETERS WHO DEVELOP UTI

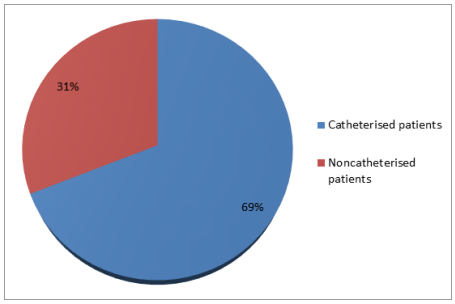

CHART (4)-PERCENTAGE OF INDOOR UTIPATIENTS WITH HOSPITAL ACQUIRED AND COMMUNITY ACQUIRED UTI

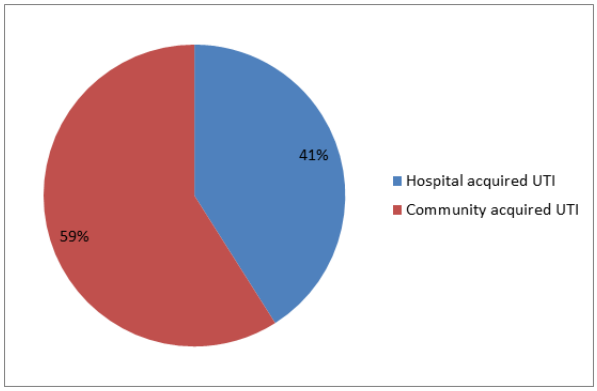

CHART (5)-Proportion of ESBL and non ESBL producing Esch. coli

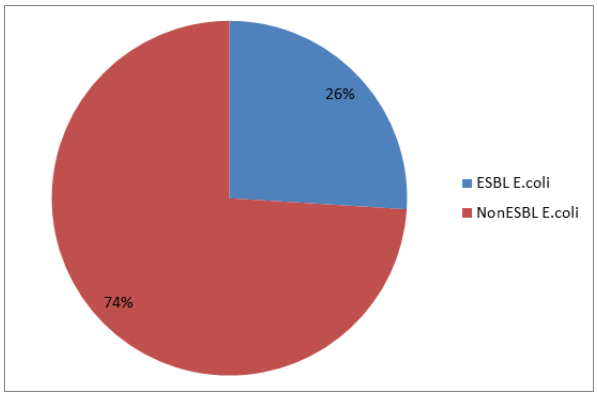

CHART (6)-GRAPH SHOWING PERCENTAGE OF LEUCOCYTE ESTERASE, NITRATE AND PUS CELLS IN URINE SAMPLES (300 SAMPLES) WHICH SHOWED GROWTH OF UROPATHOGEN

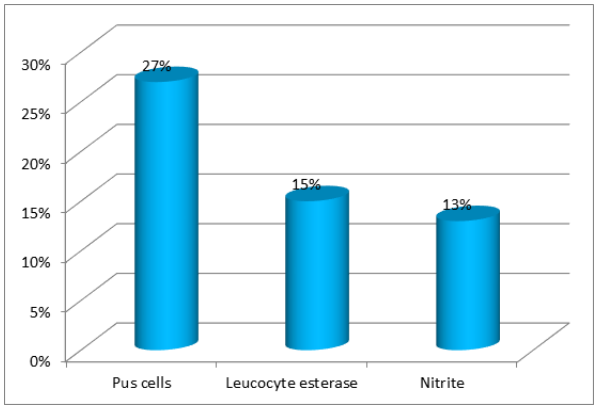

CHART (7)-PERCENTAGE OF ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF *E.COLI*

ANTIBIOTICS	ABBREVIATION	SENSITIVE	MODERATE SENSITIVE	RESISTANCE
Penicillin G	PnG	17	16	67
Methicillin	MET	28	9	63
Naficillin/Oxacillin	Naf	50	-	50
Nitrofurantoin	Nf	20	12	68
Ampicillin	amp	12	25	63
Levofloxacin	Le	25	12	63
Ciprofloxacin	Cf	46	-	54
Gatifloxacin	Gf	50	19	31
Cephalosporin III generation (Ceftazidime)	Ca	12	19	69
Vancomycin	Vn	31	06	63
Amikacin	AK	69	06	25

Cefoperazone/Salbactum	(7530)	60	27	13
Erythromycin	Er	50	19	31
Meropenem	Mem	27	13	60
Aztreonam	Azt	54	27	19
Imepenem	I	50	-	50
Tetracycline	Te	50	20	30
Fluoroquinolones	flr	36	24	40
Fluconazole	Flu	10	-	90

DISCUSSION

A total number of 300 urine samples from OPD AND IPD patient of **Index Medical College Hospital & Research Centre, Indore.** were processed. Out of these samples 240 urine samples shows growth of uropathogens, highest number was E. coli (61.9%), klebsiella (16.1%), and Candida (12.3%). That E Coli is the most common isolates is well known fact and is evidence form different studies. n a study conducted at Apollo Hospital Delhi, India ,(Bal S. 2006) E. Coli was the most prevalent uropathogen (61%) followed by klebsiella (22%) which is similar to our study and finding in our study a majority of pathogens were isolated form sexually reproductive age group. In our study the majority of isolates were from male patient. Studies conducted by Christopher et al (2009) and Philip et al (2009) showed that male patient are more than the female. It has been extensively reported that adult women have higher prevalence of UTI than male, principally due to anatomical and physiological factor.

CONCLUSION

A substantial percentage of hospitalized patients had nosocomial UTI .E. coli was found to be the most common urinary isolate both from inpatient and outpatient. There was a high proportion of ESBL production strain among the uropathogenic E. coli. isolates in the present study. Amikacin and Nafcillin are sensitive antibiotics.

REFERENCES

1. Stamm WE, Norrby SR. Urinary tract infections: disease panorama and challenges. J Infect Dis. 2001;183 (Suppl 1):S1–S4. [PubMed]
2. Schappert SM, Rechtsteiner EA. Ambulatory medical care utilization estimates for 2007. Vital Health Stat. 2011;13:1–38. [PubMed]
3. Foxman B. Urinary tract infection syndromes: occurrence, recurrence, bacteriology, risk factors, and disease burden. Infect Dis Clin North Am. 2014;28:1–13. This paper presents the most recent information about UTIs and their socioeconomic impact. [PubMed]
4. Foxman B. The epidemiology of urinary tract infection. Nature Rev Urol. 2010;7:653–660. [PubMed]
5. Hooton TM. Uncomplicated urinary tract infection. New Engl J Med. 2012;366:1028–1037. [PubMed]
6. Nielubowicz GR, Mobley HL. Host–pathogen interactions in urinary tract infection. Nature Rev Urol. 2010;7:430–441. This review compares the strategies used by two important uropathogens, E. coli and P. mirabilis, the host response to each pathogen, and the current treatments and therapies to prevent UTIs.[PubMed]
7. Hannan TJ, et al. Host–pathogen checkpoints and population bottlenecks in persistent and intracellular uropathogenic Escherichia coli bladder infection. FEMS Microbiol Rev. 2012;36:616–648.[PMC free article] [PubMed]
8. Lichtenberger P, Hooton TM. Complicated urinary tract infections. Curr Infect Dis Rep. 2008;10:499–504. [PubMed]
9. Levison ME, Kaye D. Treatment of complicated urinary tract infections with an emphasis on drug-resistant Gram-negative uropathogens. Curr Infect Dis Rep. 2013;15:109–115. [PubMed]
10. Lo E, et al. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2014 update. Infect Control Hosp Epidemiol. 2014;35:464–479. [PubMed]
11. Chenoweth CE, Gould CV, Saint S. Diagnosis, management, and prevention of catheter-associated urinary tract infections. Infect Dis Clin North Am. 2014;28:105–119. [PubMed]
12. Kline KA, Schwartz DJ, Lewis WG, Hultgren SJ, Lewis AL. Immune activation and suppression by group B Streptococcus in a murine model of urinary tract infection. Infect Immun. 2011;79:3588–3595.[PMC free article] [PubMed]
13. Ronald A. The etiology of urinary tract infection: traditional and emerging pathogens. Am J Med. 2002;113 (Suppl 1A):14S–19S. [PubMed]
14. Fisher JF, Kavanagh K, Sobel JD, Kauffman CA, Newman C. A Candida urinary tract infection: pathogenesis. Clin Infect Dis. 2011;52 (Suppl 6):S437–S451. [PubMed]
15. Chen YH, Ko WC, Hsueh PR. Emerging resistance problems and future perspectives in pharmacotherapy for complicated urinary tract infections. Expert Opin Pharmacother. 2013;14:587–596.This paper highlights the emerging resistance among bacterial pathogens, the problems we face in combating these resistant bacteria and potential effective agents for the treatment of UTIs caused by multidrug-resistant pathogens. [PubMed]
16. Jacobsen SM, Stickler DJ, Mobley HL, Shirtliff ME. Complicated catheter-associated urinary tract infections due to Escherichia coli and Proteus mirabilis. Clin Microbiol Rev. 2008;21:26–59.[PMC free article] [PubMed]
17. Kostakioti M, Hultgren SJ, Hadjifrangiskou M. Molecular blueprint of uropathogenic Escherichia colivirulence provides clues toward the development of anti-virulence therapeutics. Virulence. 2012;3:592–594. [PMC free article] [PubMed]