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A STUDY OF ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF ISOLATES FROM SUSPECTED CASES OF URINARY TRACT INFECTION IN A TERTIARY CARE HOSPITAL IN JHARKHAND

Clinical Microbiology

Sumangala Biswas Assistant Professor, Department of Microbiology, MGM Medical College, Jamshedpur
Priyadarshini* Tutor, Department of Microbiology, MGM Medical College, Jamshedpur *Corresponding Author
Anita Sundi Tutor, Department of Microbiology, MGM Medical College, Jamshedpur
Piyali Gupta Assistant Professor, Department of Microbiology, MGM Medical College, Jamshedpur
Preety Mohankumar Associate Professor, Department of Microbiology, MGM Medical College, Jamshedpur

ABSTRACT

This study is based on urine culture and sensitivity of the samples collected from the suspected cases of urinary tract infection visiting the outdoor of MGM Medical College and Hospital, Jamshedpur. The isolates are subjected to biochemical identification and susceptibility testing and the result is correlated with microscopic findings. This data can be used to determine the prevalence of Urinary Tract Infection and study the Antimicrobial Susceptibility Pattern of the isolated bacteria. In this study 309 urine samples were collected over a period of 6 months and culture sensitivity was performed using conventional methods. 44.6% of the urine samples showed growth. The predominant isolate was Escherichia coli followed by Klebsiella pneumoniae.

KEYWORDS

UTI, Susceptibility, Antibiotic.

INTRODUCTION:

Urinary Tract Infection is the most common Hospital Acquired Infection and the Second most common Community Acquired Infection after Respiratory Tract Infection.[1] It had caused significant morbidity in the pre-antibiotic era and several chemotherapeutic agents were introduced in the early 20th century which were relatively ineffective.

Nitrofurantoin was the first effective and tolerable Antimicrobial Agent for Urinary Tract infection, introduced in the 1950s.[2] The discovery and use of Antimicrobial Agent led to the emergence of another challenge in the form of Antimicrobial Resistance. More than 50% of the common organisms isolated in the Indian Hospitals are resistant to some of the frequently used drugs such as Fluoroquinolones and Third generation Cephalosporins.[3] In the present study an attempt has been made to determine the prevalence of Urinary Tract Infection and to study the Antimicrobial Susceptibility pattern of the isolated bacteria.

AIMS AND OBJECTIVES:

The aim of the study is to isolate and identify the isolates from patients having UTI and study the antimicrobial pattern among the gram-negative isolates. This will also help guide the clinicians in choosing the proper antimicrobial agent for treatment of patients with UTI.

MATERIAL AND METHOD:

This study was conducted from June 2021 to November 2021 at the Department of Microbiology, MGM Medical College and Hospital, Jamshedpur. A brief history of the patients was obtained about urgency or frequency of micturition associated with discomfort or pain. The samples were collected in pre-sterile, dry, wide-mouthed, screw capped, leak proof universal plastic container. Thereafter, they were immediately transported to laboratory for processing. Samples were received in the laboratory after being checked for quality followed by assignment of a laboratory ID. Urine was examined microscopically as a wet preparation to detect pus cells, RBCs, casts, Yeast cells, motile Trichomonas vaginalis trophozoite, Schistosoma hematobium eggs and bacteria. The media used for culture was 5% sheep blood agar, McConkey Agar and Nutrient Agar. The sample was inoculated using a calibrated loop of diameter 1.3mm designed to deliver 1µL of urine and streaked using Evolve procedure. This was followed by overnight incubation at 35±2°C. The plates were examined the subsequent day for significant growth.

- $<10^3$ CFU/ml Insignificant bacteriuria; UTI is unlikely[1]
- $10^3 – 10^5$CFU/ml Probably significant bacteriuria; UTI likely[1]
- $>10^5$ CFU/ml Significant bacteriuria; UTI is certain[1]

Thereafter microscopic examination using grams stain and hanging drop preparation was performed. The final identification was done using biochemical tests viz Oxidase test, Catalase test, Coagulase test, Indole test, Sugar fermentation, Citrate utilization and Bile Aesculin hydrolysis test. Antimicrobial Susceptibility test was performed with the help of the Kirby-Bauer Disc Diffusion method using commercially available disks. The interpretation of the result was done with the help of CLSI guidelines. Following antimicrobial agents were used:

Table 1 Antimicrobials used for carbohydrate fermenting gram-negative bacilli

AGENT	SYMBOL	STRENGTH
CEFTAZIDIME	CAZ	30 mcg
CEFUROXIME	XM	30 mcg
CEFOTAXIME	CTX	30 mcg
AZTREONAM	AT	30 mcg
GENTAMICIN	GM	10 mcg
AMIKACIN	AK	30 mcg
CIPROFLOXACIN	CI	5 mcg
MEROPENEM	MRP	10 mcg
NITROFURANTOIN	NI	300 mcg
OFLOXACIN	OF	5 mcg
NORFLOXACIN	NOR	10 mcg
NALIDIXIC ACID	NA	30 mcg
CEFDINIR	CD	5 mcg
CEFIXIME	FIX	5 mcg
CEFTRIAXONE	CRO	30 mcg

RESULT:

A total of 309 samples were processed during the period of study, out of which 148 samples showed growth and 161 samples did not show any growth after 48 hours of aerobic incubation out of which 31 samples showed growth of contaminants. The isolation rate of is demonstrated in the following chart:

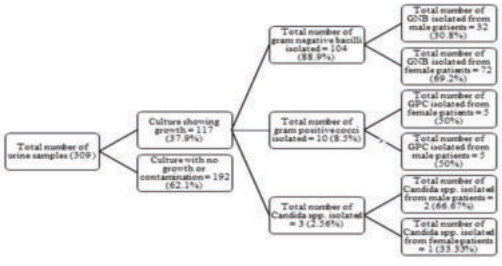

Fig 1 Isolation Rate from the urine samples

The predominant isolate was Escherichia coli (61.5%) followed by Klebsiella pneumoniae (23.1%). The distribution and isolation rate of various bacteria are depicted in the following chart.

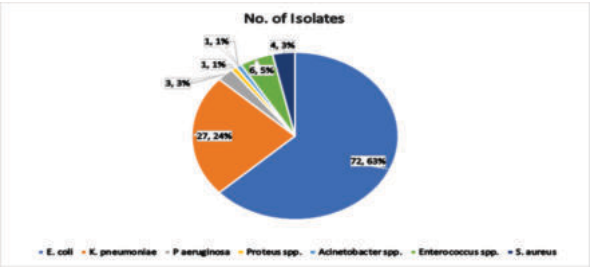

Fig 2

All the gram-negative isolates were found to be susceptible to carbapenem. The antimicrobial susceptibility pattern of all the gram-negative isolates is depicted in the following chart.

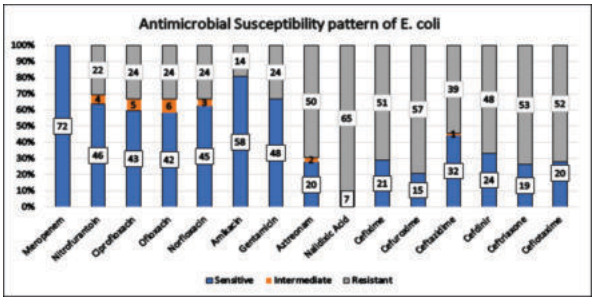

Fig 3

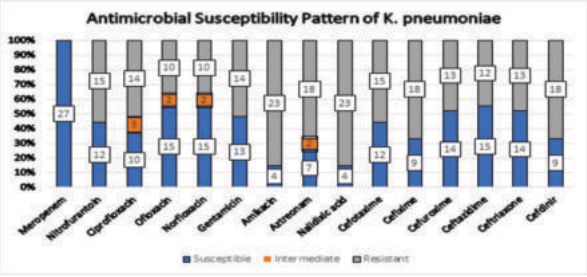

Fig 4

Interpretation:

44.6 % of urine samples which were received in the laboratory were culture positive. This has been compared to the isolation rate of other similar studies in Table 2.

Table 2

S No.	Name of the Study	Isolation Rate
1	Bhuvnesh Kalal et al [4]	28.1%
2	Nirmaljeet Kaur et al [5]	15.7%
3	Chirag Kukadiya et al [6]	36.85
4	Monali Mishra et al [7]	80.0%
5	Current Study	44.6%

E. coli was the predominant Gram-Negative Bacilli responsible for Urinary Tract Infection followed by Klebsiella pneumoniae and Enterococcus species. The comparison with other studies is illustrated in

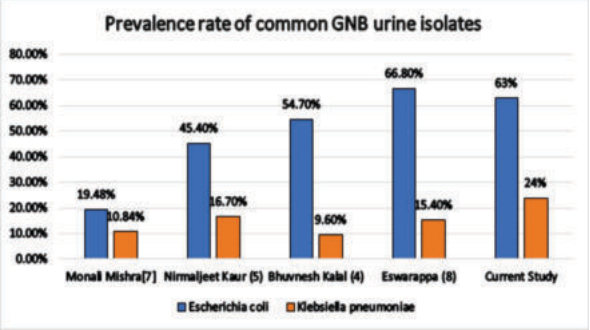

Figure 5

Resistance rates among E. coli isolates was >50% for Cephalosporins (Ceftazidime, Cefixime, Cefotaxime, Ceftriaxone, Cefuroxime and Cefdinir). It was equally high for Fluoroquinolones (Ciprofloxacin, Ofloxacin and Norfloxacin). 30.6% of isolates were susceptible to Nitrofurantoin which is one of the most popular drug of choice for treatment of Urinary Tract Infection. However, none of the isolates were resistant to Carbapenems. Resistance rates were very high among Klebsiella isolates as almost half of the isolates were resistant to the commonly used drugs for Urinary Tract Infection viz Cephalosporins, Fluoroquinolones and Aminoglycosides. 44.3% isolates were susceptible to Nitrofurantoin and no resistance to Carbapenems was reported. The result of Klebsiella and E. coli was compared.

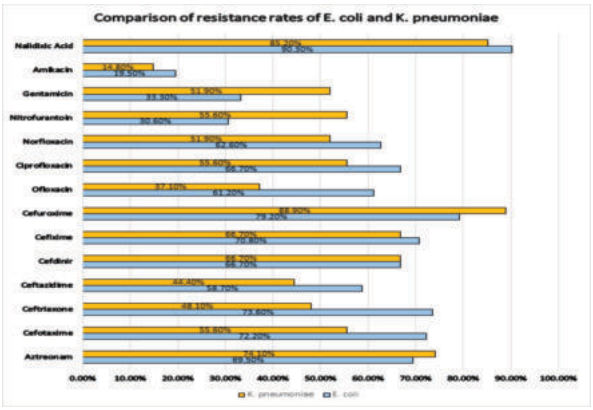

Figure 5

Ceftazidime resistance was seen in 44.4% K. pneumoniae isolates and 58.7% E. coli isolates which is an indicator of ESBL prevalence.[9] No other phenotypic or genotypic test was further done to identify resistance pattern.

CONCLUSION:

A high rate of resistance against the first line drugs was seen and this can make the patient management a difficult task. To make the best use of resources it would be desirable to extend the study coverage by including inpatients and other patients from different wards. It is essential to incorporate a test to detect beta-lactamase and carbapenemase activity to enhance the quality of the test result and benefit the clinicians and patients in the end. The last few decades have witnessed only a rise in the rate of antimicrobial resistance which is not only an issue for the healthcare sector but also an economic and environmental issue. To deal with this ever-growing threat, CDC recommended in 2014 that all the acute-care hospitals should implement antimicrobial stewardship programme through inter-disciplinary co-ordination. Infection interventionists and hospital epidemiologists should co-ordinate facility wise monitoring and prevention of healthcare associated infection by analyzing, auditing, and reporting data. Education of the staff and implementation of the strategies to optimize the use of antibiotics is integral to the antimicrobial resistance control measures.

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