Original article

Bacteriological profile of Urinary tract infections: A retrospective North Indian study

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Abstract

Urinary tract infections (UTI) are the second most common bacterial infections causing significant morbidity and increased healthcare costs. Risk factors include extremes of age, female sex, anatomical or physiological defects, presence of catheter and previous surgery or antibiotic use. In recent years, the inappropriate use of antibiotics has contributed to the emergence of multidrug resistant organisms which is associated with high morbidity, mortality and healthcare costs.

Clean catch mid-stream urine samples over a six month period were tested for cultures. Isolation, identification of organisms and antibiotic sensitivity test was done. A total of 1191 samples were analyzed during the study period (July- December 2024), of which 497 were positive, yielding a positivity rate of 41.7%.

Among Gram-negative isolates, Escherichia coli (46%) were predominant. Gram positive isolates included Enterococcus fecalis (10%), Enterococcus faecium (5%) and Staphylococcus aureus (3%).Fungal isolates accounted for 2% of the total positive isolates, predominantly Non-albicans Candida species (NAC). Antimicrobial resistance patterns demonstrated the highest resistance among Pseudomonas aeruginosa and Klebsiella pneumoniae.

This study underscores the importance of surveillance of uropathogens and the antibiotic susceptibility patterns. This is essential for guiding the empirical treatment and formulate effective antimicrobial stewardship practices.

Key words: Urinary tract infections, antibiotic stewardship, Multidrug resistant organisms.

Introduction

The urinary tract comprises the urethra, bladder, urethra and kidneys[1]. Urinary tract infections (UTI) are the second most common bacterial infections causing significant morbidity and increased healthcare costs. Risk factors include extremes of age, female sex, anatomical or physiological defects, presence of catheter and previous surgery or antibiotic use[2,3]. UTIs may be either community or hospital acquired[4]. The most common aetiological agents of UTI include Escherichia coli, Klebsiella spp., Staphylococcus aureus, Proteus spp., Pseudomonas aeruginosa, Enterococci spp., Enterobacter sp. and Candia spp[5].

In recent years, the inappropriate use of antibiotics has contributed to the emergence of multidrug resistant organisms, particularly Extended spectrum b-lactamases (ESBL) producing and Carbapenem resistant Enterobacterales (CRE)[6]. These multidrug resistant microorganisms pose a serious therapeutic challenge and are associated with high morbidity, mortality and healthcare costs. Therefore, accurate identification of uropathogens and antimicrobial susceptibility testing are essential to guide appropriate therapy and limit the spread of resistance[7,8].

The present study was undertaken to identify the microorganisms causing UTIs and to determine the prevalence of ESBL producers and CRE isolates in a tertiary care hospital in North India.

Materials and methods

The study was conducted in a tertiary care hospital in North India. All patients clinically diagnosed with urinary tract infections during July-December 2024 were included in the study.

Clean catch mid-stream urine samples of these patients were tested for cultures. Isolation and identification of organisms was done as per standard protocols of the laboratory. Antibiotic sensitivity test was done by Kirby-Bauer disc diffusion method and MDR strains (ESBLs) were detected by double disc diffusion method. MRSA were detected by cefoxitin disc. Interpretation was done as per CLSI guidelines.

Results

A total of 1191 samples were analyzed during the study period (July- December 2024), of which 497 were positive, yielding a positivity rate of 41.7%.

Among Gram-negative isolates, Escherichia coli (46%) were predominant, followed by Klebsiella pneumoniae (10%), Klebsiella oxytoca (6%), Pseudomonas aeruginosa (8%), Proteus sp. (4%), Acinetobacter sp. (2%) and Citrobacter sp. (2%). Gram positive isolates included Enterococcus fecalis (10%), Enterococcus faecium (5%) and Staphylococcus aureus (3%).Fungal isolates accounted for 2% of the total positive isolates, predominantly Non-albicans Candida species (NAC).

Antimicrobial resistance patterns (Figures 1-4) demonstrated the highest resistance among Pseudomonas aeruginosa and Klebsiella pneumoniae.

Table 1: Distribution of Microorganisms isolated (n=497)

ORGANISM ISOLATED	TOTAL	PERCENTAGE
Escherichia coli	228	46%
Klebsiella pneumoniae	51	10.3%
Klebsiella oxytoca	33	6.6%
Pseudomonas aeruginosa	40	8%
Acinetobacter sp.	11	2.2%
Citrobacter sp.	11	2.2%
Proteus sp.	11	2.2%
Enterococcus fecalis	50	10%
Enterococcus faecium	24	5%
Staphylococcus aureus	17	3.5%
Candida sp	10	2%

Figure 1: Antimicrobial resistance pattern: Enterobacteriaceae

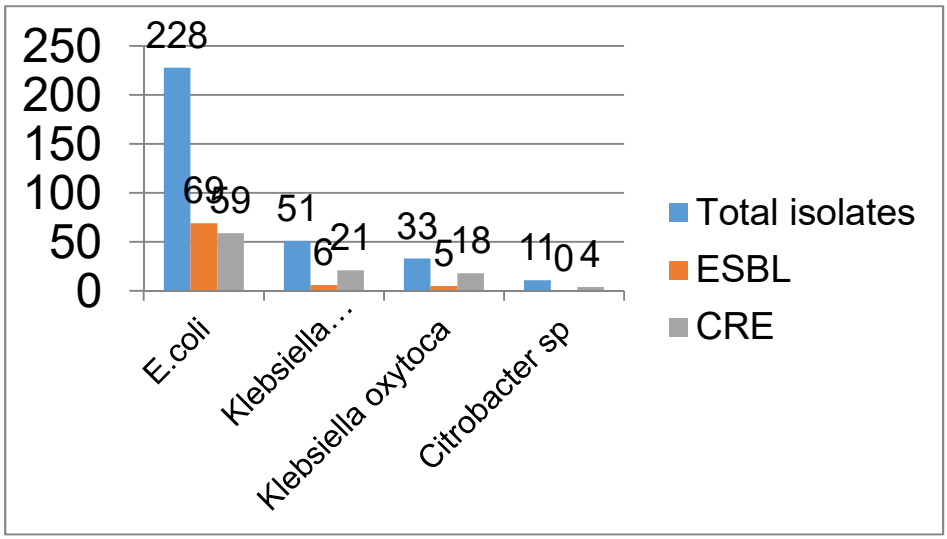


Figure 2 : Antimicrobial resistance pattern: Non-fermenters

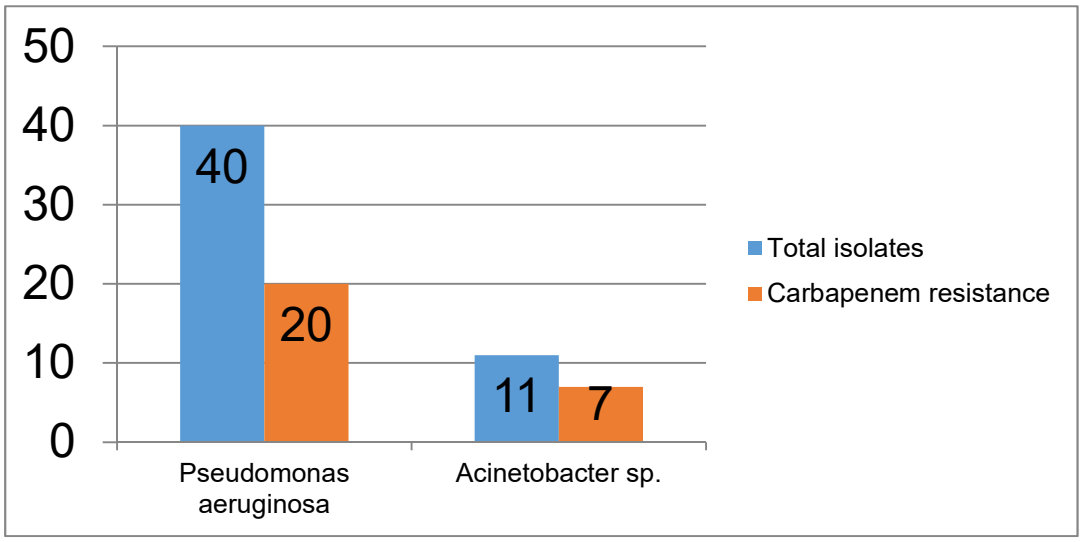


Figure 3: Antimicrobial resistance pattern: Staphylococcus aureus

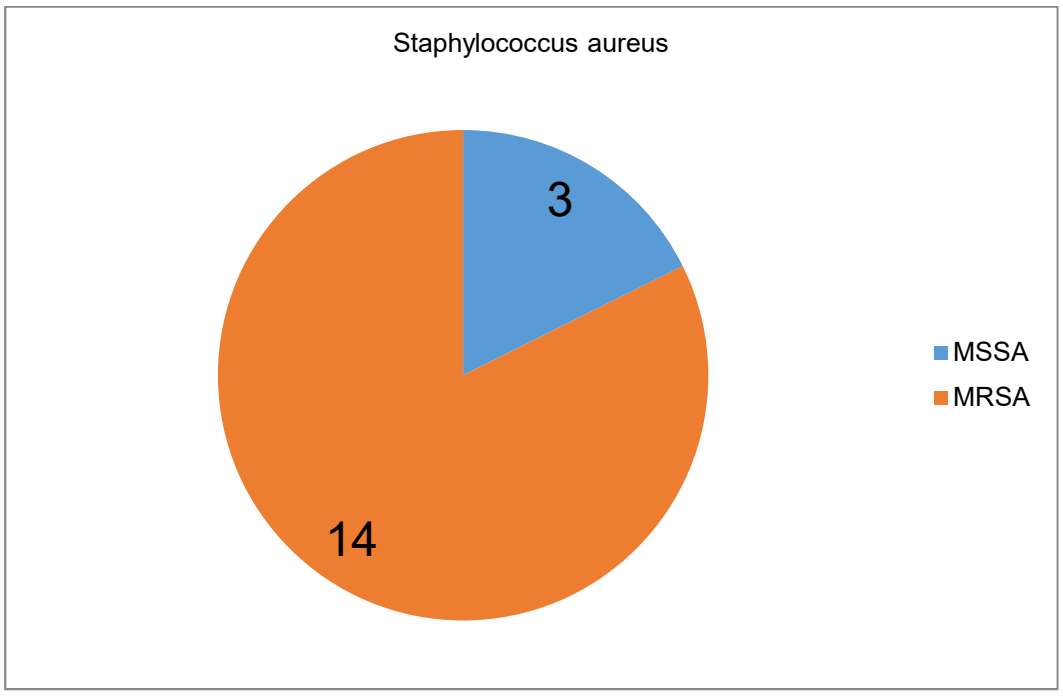


Figure 4: Antimicrobial resistance pattern: Enterococcus sp.

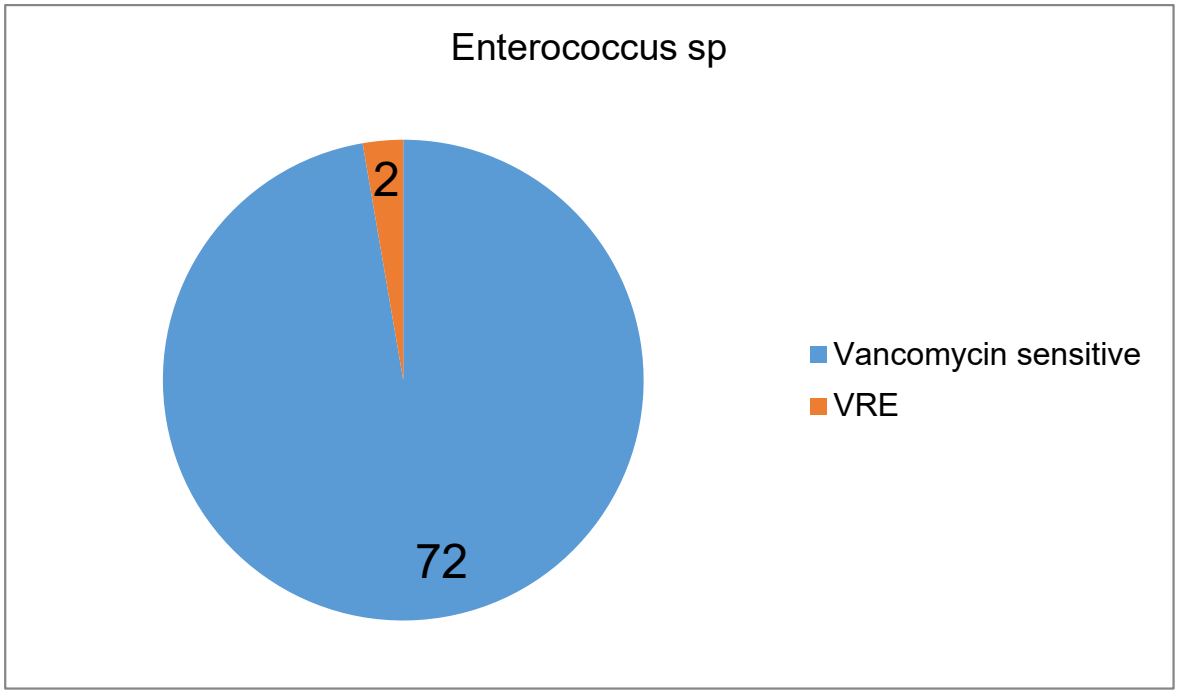
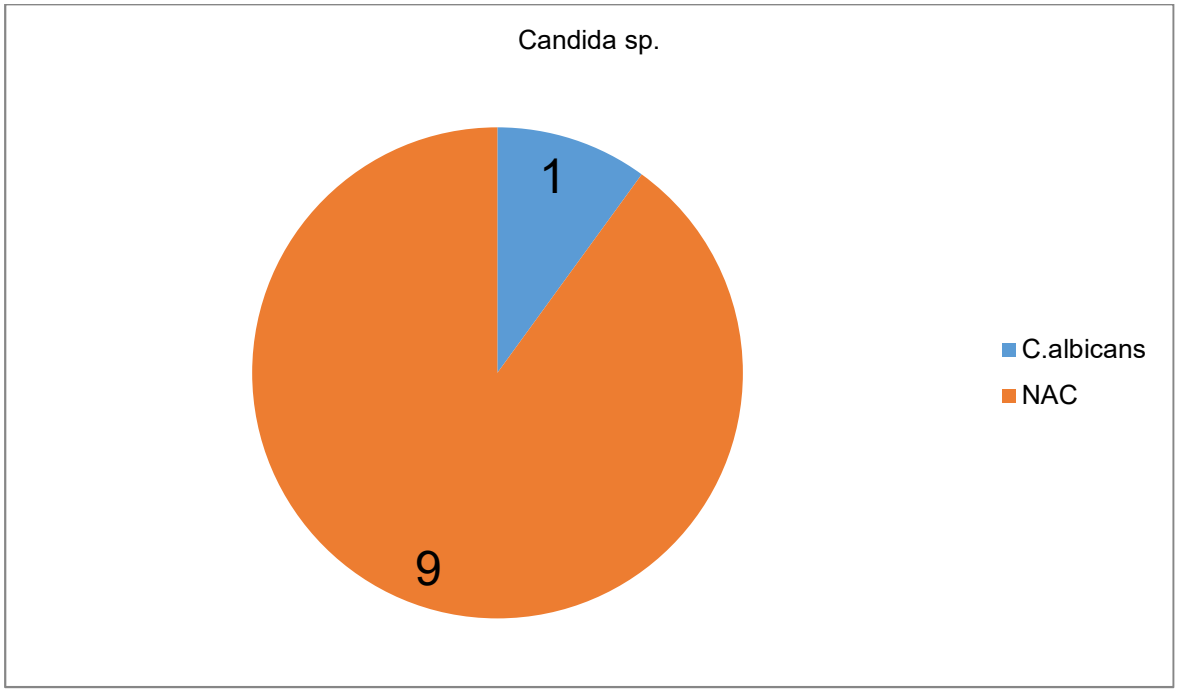


Figure 5: Distribution of Candida sp.



Discussion

In the hospital environment, the etiology and antibiotic patterns change over a period of time[9]. Hence it is important to formulate an antibiotic policy on the basis of previous year's antibiogram.

The present study demonstrates a high positivity rate (41.7%) among urinary samples, indicating substantial burden of urinary tract infections (UTIs). Among the isolates, Escherichia coli was the predominant uropathogen (46%) which is consistent with the previous studies[10,11]. The high prevalence of Klebsiella pneumoniae and Pseudomonas aeruginosa further highlights the increasing nosocomial

infections. Gram positive infections accounts for around 18% of total infections. However their role in catheterized patients is of utmost importance.

The detection of Non-albicans Candida (NAC) in 2% patients is noteworthy as these are usually associated with immunocompromised states, prolonged antibiotic use and invasive procedures. The presence of Extended spectrum beta lactamases (ESBL) in E.coli isolates was 30% which correlates with previous studies[12,13]. Carbapenem resistance was reportedly high in Klebsiella pneumoniae and Pseudomonas aeruginosa, highlighting the high morbidity and high healthcare costs associated[14,15,16].

This study underscores the importance of surveillance of uropathogens and the antibiotic susceptibility patterns. This is essential for guiding the empirical treatment and formulate effective antimicrobial stewardship practices.

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