

# Bacterial Uropathogens from Patients of Symptomatic Benign Prostatic Hyperplasia at a Tertiary Care Hospital in India

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**Abstract:** *Benign Prostatic Hyperplasia (BPH) predisposes the patients to Urinary Tract Infections (UTI) which causes significant morbidity. Urine from such patients suffering from LUTS was cultured for bacterial uropathogens and ABST was done. The predominant bacterial isolate among gram negative bacteria was E. coli n=70 (36.26%) and among gram positive was Staphylococcus aureus n= 21(10.89%). The resistance in Enterobacteriaceae encountered in our study was: Ampicillin (65.15%), Augmentin (60.6%), Piperacillin-Tazobactam (31.81%), Cefepime (31.06%), Ceftriaxone (30.3%), Imipenem (13.63%), Gentamicin (32.57%), Tetracycline (43.93%), Ciprofloxacin (46.96%), Cotrimoxazole (43.93%), Nitrofurantoin (25.75%) and Chloramphenicol (41.66%). Amongst the gram positive isolates the incidence of MRSA isolates was 23.81%.*

**Keywords:** BPH, UTI, Uropathogens, Resistance

## 1. Introduction

Benign Prostatic Hyperplasia (BPH) is a common condition in elderly male [1] characterized by progressive enlargement of the prostate[2]. It's a non-malignant condition in which the lumen of the prostatic urethra is compromised by fibro adenomatous growth in the periurethral region. Urine outflow is progressively reduced leading to urinary stasis which in turn predisposes the patients to Urinary Tract Infections (UTI). Symptomatic BPH causes significant morbidity which in turn is due to both storage and voiding abnormalities [3], [4]. Other factors include reduction in zinc associated antimicrobial factor and increasing alkalinity of prostatic fluid. BPH is one of the most common causes of Lower Urinary Tract Symptoms (LUTS) such as difficulty starting urination, frequent need to urinate, difficulty in fully emptying the bladder, straining and dribbling[5]. Studies have shown increasing incidence of BPH with age with 20% in the age group of 40-50 and 80% in the age group of 70-80 years respectively[6]. Bladder Outlet Obstruction (BOO) secondary to BPH can lead to complications like recurrent UTI, hematuria, kidney and/or bladder calculi and kidney failure[7]. Study of bacterial uropathogens and their antibiotic sensitivity pattern in symptomatic BPH patients will go a long way in helping clinicians effectively manage the condition, prevent spread of Anti-Microbial Resistance(AMR) and development of complications associated with BPH.

### Aim

To determine the prevailing bacterial uropathogens along with their antibiotic sensitivity pattern in patients of symptomatic BPH.

## 2. Material and Methods

The cross-sectional study was carried out in a tertiary care hospital from June 2018 to May 2019. The inclusion criteria included: 1) Male patients suffering from LUTS; 2) Age range of the patients include  $\geq 41$  years; 3) Patient with BPH confirmed by radiological examination and Prostate Specific Antigen (PSA) test. The exclusion criteria included: 1) Patients ageing  $\leq 40$  years; 2) Patients who were on antibiotics in the last 48 hrs; 3) Patient on indwelling catheter; 4) Immunocompromised status.

Following informed consent the clinical history along with the signs and symptoms like frequency, urgency, hesitancy, straining, difficulty initiating and incomplete bladder emptying were collected from 324 patients. They were then subjected to Ultrasonography (USG) and PSA test to confirm the presence of BPH. Mid-stream clean catch urine sample was collected into universal sterile wide mouthed containers [8]. Samples were divided in two parts and processed within two hours of collection. One part was subjected to microscopy and the second part was subjected to culture and antibiotic sensitivity tests. The centrifuged specimen was examined under 10X and 40X for the presence of pus cells, RBC's, casts, crystals and bacteria which were recorded accordingly. The second part was cultured using a standard double wire loop of 4mm diameter onto Cysteine Lactose Electrolyte Deficient (CLED) agar and incubated aerobically at 37°C for 18-24 hrs. Plates were examined for bacterial growth and those showing Bacterial growth of  $\geq 10^5$  CFU/ml were taken to be significant. Identification was based on colony characteristics, Gram stain and biochemical reactions [9]. Identified isolates were subjected to Antibiotic sensitivity testing using the Kirby Bauer method while following the CLSI 2018 guidelines [10]. The control strains used were *Escherichia coli*

American Type Culture Collection (ATCC) 25922 and *Staphylococcus aureus* ATCC 25923.

### 3. Result

Total of 324 urine specimens were processed which met the inclusion criteria for this study. The mean age group of the patient was 78.5 years. Majority of the patients belonged to age group 71-85 years n=146 (45.06%) followed by age group 56-70 n=128 (39.51%) and 41-55 n= 46 (14.20%). Growth was obtained from 193 (59.57%) samples. Maximum Isolates were from the specimen of age group 71-85 years n= 103 (53.37%) followed by age group 56-70 n=66 (34.20%) and 41-55 n= 20 (10.36%) Table 1.

**Table 1:** The percentage of isolates from different age groups of patients of BPH

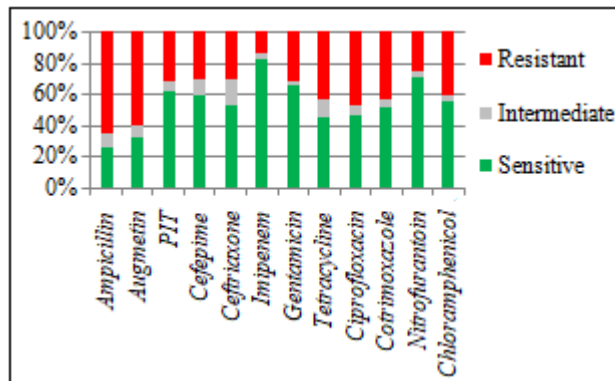
Sl no	Age group	Total patients	Growth obtained from (x)	Percentage of isolated organisms (x/193)
1.	41-55 yrs	46	20	10.36%
2.	56-70 yrs	128	66	34.20%
3.	71-85 yrs	146	103	53.37%
4.	>85 yrs	4	4	2.07%
	TOTAL	324	193	

The predominant bacterial isolate among gram negative bacteria were *E. coli* n=70 (36.26%), *Klebsiella* species n=62 (32.12%) and *Pseudomonas* species n=21 (10.89%) and among gram positive were *Staphylococcus aureus* n=21 (10.89%) and *Enterococcus* species n=7 (3.63%) Table 2.

**Table 2:** The frequency of bacteria isolated from patients of BPH

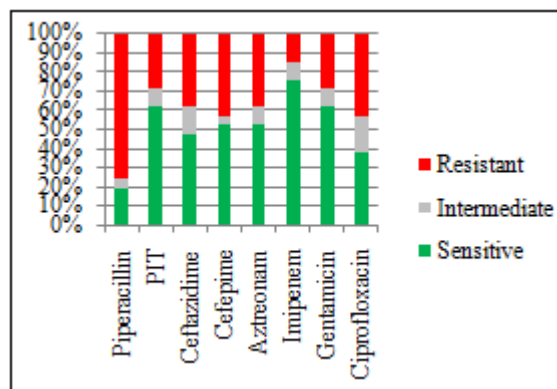
Sl no	Bacteria	Frequency	Percentage
1.	<i>Escherichia coli</i>	70	36.26%
2.	<i>Klebsiella pneumonia</i>	62	32.12%
3.	<i>Pseudomonas aeruginosa</i>	21	10.89%
4.	<i>Acinetobacter</i> Spp	5	2.59%
5.	<i>Citrobacter</i> Spp	3	1.55%
6.	<i>Proteus</i> Spp	4	2.07%
7.	<i>Staphylococcus aureus</i>	21	10.89%
8.	<i>Enterococcus</i> Spp	7	3.63%
	TOTAL	193	

The antibiotic sensitivity pattern for *Enterobacteriaceae* was Ampicillin (25.75%), Augmentin (31.82%), Piperacillin-Tazobactam (61.20%), Cefepime (59.09%), Ceftriaxone (53.03%), Imipenem (81.81%), Gentamicin (65.15%), Tetracycline (45.45%), Ciprofloxacin (46.21%), Cotrimoxazole (51.51%), Nitrofurantoin (70.45%) and Chloramphenicol (54.54%) respectively Fig 1.



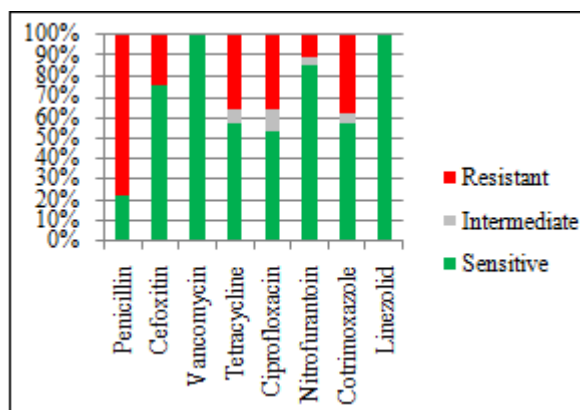
**Figure 1:** Susceptibility pattern of *Enterobacteriaceae*

The antibiotic sensitivity pattern for *Pseudomonas* spp was Piperacillin (19.04%), Piperacillin-Tazobactam (61.9%), Ceftazidime (47.61%), Cefepime (52.38%), Aztreonam (52.38%), Imipenem (76.19%), Gentamicin (61.9%) and Ciprofloxacin (38.09%) respectively Fig 2.



**Figure 2:** Susceptibility pattern of *Pseudomonas* Spp

The antibiotic sensitivity pattern for Gram positive isolates was Penicillin (21.43%), Cefoxitin (76.19%), Vancomycin (100%), Tetracycline (57.14%), Ciprofloxacin (53.57%), Nitrofurantoin (85.71%), Cotrimoxazole (57.14%) and Linezolid (100%) respectively Fig 3.



**Figure 3:** Susceptibility pattern of Gram positive isolates

### 4. Discussion

With age, the normal functioning of urinary tract of men is compromised both structurally and functionally most common of which is BPH. It causes obstruction and turbulent urine flow which predisposes to Urinary Tract Infections. We got an overall prevalence of Urinary Tract

Infection (UTI) to be 59.57% among the BPH patients. PremPraksh Mishra et al in a similar study reported a prevalence of 62.86% [11]. Another study conducted in a tertiary hospital of Nigeria showed overall prevalence of 33% [12]. The difference can be attributed to the different age profile of the patients in the study. Our study demonstrates increasing number of the pathogens isolated among the patients of BPH with increasing age, we got a prevalence of 43.47% among patients of 41-55 years age group, 51.56% among 56-70 years, 70.54% among 71-85 years and highest of 100% among patient >85 years. Similar prevalence of LUTS as 56% in men of 50-79 years, 70% in 80-89 years and 90% in men of 90 years of age has been reported in various other studies [11],[13],[14]. In our study *Escherichia coli* (36.26%) was the most frequently isolated species followed by *Klebsiella* Spp (32.12%) and *Pseudomonas* Spp (10.89%). Amongst the gram positive organism most frequently isolated organism was *Staphylococcus aureus* (10.89%). Similar results have been reported in other studies conducted across the world [11], [12], [15], [16]. The antibiotic susceptibility testing revealed a high degree of resistance to majority of the oral first line drugs particularly the  $\beta$ -lactams and fluoroquinolones. The resistance in *Enterobacteriaceae* towards commonly used antibiotics encountered in our study was: Ampicillin (65.15%), Augmentin (60.6%), Piperacillin-Tazobactam (31.81%), Cefepime (31.06%), Ceftriaxone (30.3%), Imipenem (13.63%), Gentamicin (32.57%), Tetracycline (43.93%), Ciprofloxacin (46.96%), Cotrimoxazole (43.93%), Nitrofurantoin (25.75%) and Chloramphenicol (41.66%). Amongst the gram positive isolates the incidence of MRSA isolates was 23.81%. Various studies across India have reported similar resistance rates in *E. coli* – 63.6–88% against aminopenicillins, 35–75% against ciprofloxacin, and 40–76% against trimethoprim-sulphamethoxazole [17], [18], [19]. High resistance rates shown by the isolates from this study may be due to the fact that patients with BPH recurrently experience UTI which must have exposed the patients to use of different antibiotics over a prolonged period of time leading to development of resistant strains. Sensitivity of *Enterobacteriaceae* and Gram positive isolates towards Nitrofurantoin was 70% and 85% respectively. In one large-scale study of more than 2000 isolates, Sahni et al. reported corresponding Nitrofurantoin resistance of 20% [19]. This finding is in contradiction with resistance rates of 1.1–1.8% in USA, Canada, and France [20].

## 5. Conclusion

A vast majority of elderly men are suffering from BPH and it causes significant burden on the healthcare resources of any country. The bacterial agents associated with BPH are primarily the *Enterobacteriaceae* and less commonly Gram positive organisms. To manage this condition the clinicians should take into consideration the existence due to previous episodes of UTI and development of Multi Drug Resistance (MDR) among the etiological agents during current episode. Knowledge of likely organism and local antibiogram is of paramount importance in dictating appropriate antimicrobial therapy in these patients. The rapid emergence of antimicrobial resistance highlights the

importance for obtaining a correct diagnosis and treatment with correct antibiotics.

## 6. Future Scope

Our study has not included other contributory risk factors and post treatment follow up.

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