

## Role of Urine Bacteriology Assessment in Patients with Benign Prostatic Hyperplasia

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**Abstract:** Background:Benign prostatic hyperplasia is very common in old ages. In India,few only present with symptoms . Few were detected to have the benign enlargement when they were screened prior to surgery for inguinal hernia or so. Bacteriuria and urinary tract infections are common sequelae of benign prostatic hyperplasia(BPH). Thus, the knowledge of urine bacteriology in men with symptomatic BPH in our environment may play acomplementary role in management.

**Objectives:** To determine the incidence of bacteriuria and the antibioticsensitivity pattern of bacterial isolates in cultured urine samples of men with symptomatic and asymptomatic BPH.

**Material andMethods:** This was a prospective study conducted over one year in our institute . All patients who presented with lower urinary tract symptoms dueto BPH and who met the inclusion criteria were studied.and also all the old patients admitted for direct inguinal hernia surgery without clinical symptoms of BHP but whose ultrasound examination showed prostate enlargement with significant residual urine volume were included. Urine samples were obtained from the patients for microscopy, culture, and sensitivity following standard protocol.

**Results:** Sixty two patients were studied.out of which 38 patients had symptoms of BPH and24 patients were belonging to the asymptomatic group. The age range was 53-80 years with a mean of 65.5 . Bacterial isolates were noted in 28 (45.1%) patients. Escherichia coli noted in 20 out of this 28 patients(71.4%).klebsiella and other organisms were isolated in the rest.27 out of 38 symptomatic patients(71%) and one out of 24 asymptomatic patients(4%) had bactriuria

. The bacterial isolates were mostly sensitive to imipenem, meropenem, and nitrofurantoin, but showed greater resistance to cefuroxime, gentamicin, and ofloxacin. There was no significant difference between the means for age (, duration of symptoms , and prostate size in the patients with andthose withoutbactriuria.

**Conclusion:** In patientswith BPH ,71% of them have urinary infection with bactriuria in our setting . The bacterial isolates showed high level of resistance to oralcephalosporins and fluoroquinolones. There is a need to update guidelines in empiric use of antibiotics in this group of patients.

**Keywords:** Bacteriuria, benign prostatic hyperplasia, urinary tract infection

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### I. Introduction

Benign prostatic hyperplasia (BPH) is a common condition in the aging male population. [1] Symptomatic BPH,a cause of significant morbidity in affected males, is characterized by both storage and voiding.Lower urinarytract symptoms with significant impairment in the quality of life. [2],[3] Affected individuals are prone to the development of bacteriuria as a result of incomplete bladder emptying,urinary stasis, and urethral instrumentation such as cystoscopy and catheterization. [4] A reduction in theconcentration of zinc-associated antimicrobial factor and increasing alkalinity of prostatic fluid with aging mayalso encourage bacterial colonization of the urinary tract in these patients. [5] Some cases ofbacteriuria mayprogress to established urinary tract infection (UTI) if host's defense mechanisms are overcome. [4]The reported incidence of bacteriuria in men with symptomatic BPH prior to prostatectomy varies with differentstudies. [6],[7] Pourmandet al. [7] noted a preoperative rate of 15% which was reduced to 3.3% afterprostatectomy following antibiotic administration. The presence of bacteriuria prior to surgical intervention hasbeen shown to increase the risk of postoperative infective complications such as UTI and wound infection. [8]

Thus, the knowledge of urine bacteriology as well as the antibiotic susceptibility pattern prevailing in the localality in a given period may play a complementary role in the management of patients with BPH. It is expected thatsuch knowledge will enable better antibiotic selection in prophylactic and empirical treatment of UTI duringmanagement.

Therefore, the study was aimed at defining the prevailing bacteriology of urine in men with symptomatic and asymptomaticBPH in our environment.

## II. Materials and Methods

The study, prospective and descriptive in nature, was done at our institute over a 1Yr period (March 2017 - February 2018). Male patients who were diagnosed to have lower urinary tract symptoms due to BPH and also patients who were admitted for inguinal hernia surgery and whose ultrasound examination was suggestive of prostate enlargement with a residual urine volume of more than 80 ml formed the study population. Sixty two patients who met the inclusion criteria within the period were studied. Patients with recent history of catheterization for any reason and recent intake of antibiotics due to any reason, immune compromised patients and diabetics were excluded.

### Methods

Following informed consent, a proforma was opened for each patient to record demographic characteristics, symptoms, and urine microbiology outcome. The size of the prostate on abdominal ultrasonography, as well as the prostate-specific antigen value, was recorded for all patients. Postvoid residual urine volume was recorded for all the patients. mid-stream urine specimens were collected from the patients after evaluation in the outpatient department. All specimens were sent to the medical microbiology unit and processed within 2 hrs of collection.

### Methodology for specimen collection, transport, and processing

Urine specimens were collected from the patients into a sterile universal container and transported to the microbiology laboratory. The specimens were subjected to microscopy, culture, and sensitivity. The spun deposit of urine centrifuged at 500-1000 g for 5 min were examined microscopically for the presence of bacteria, white blood cells (WBCs), casts, and crystals. Pyuria referring to the presence of  $\geq 10$  WBCs per high power field was noted. Specimens were inoculated onto cystine lactose electrolyte deficient agar and blood agar plates, and incubated aerobically at 35-37°C for 24 h. A bacterial count of  $\geq 10^4$  CFU/ml of urine was considered significant. Identification of isolated colonies was based on colony appearance on agar, microscopy of Gram stained smears, and standard biochemical procedures. Identified isolates were subjected to antimicrobial sensitivity testing using the modified Kirby Bauer disc diffusion method as specified by the clinical laboratory standard institute guidelines. [9] The species of bacteria isolated as well as their antibiotic susceptibility patterns were recorded in the proforma.

## III. Results

A total of 62 patients were studied. The age range of the patients was 53-80 years with a mean of 65.5  $\pm$  7.8 years. The duration of lower urinary tract symptoms ranged between 2 and 30 months (mean, 21.2  $\pm$  21.1 months) whereas the prostate size on abdominal ultrasonography ranged between 33 and 255 g (mean, 92.3  $\pm$  54.0 g). 28 out of 62 (45.1%) patients had positive urine culture. 12 patients with bacteriuria had associated dysuria and pyuria in addition to the lower urinary tract symptoms of BPH. *Escherichia coli* was the most common organism isolated (71%) whereas the least, *Providencia* species, was noted in 1 (2.4%). There was no significant difference between the means for age (65.2 vs. 65.7 years,  $P = 0.80$ ), duration of symptoms and prostate size (97.5 vs. 87.2 g,  $P = 0.52$ ) in the patients with and those without bacteriuria. The postvoid residual urine volume in the 62 patients without acute retention ranged from 80 to 300ml with a mean of 120 ml. There was no significant difference in the mean residual volume of patients with and those without bacteriuria ( $P = 0.29$ ). The bacterial isolates on susceptibility testing were mostly sensitive to imipenem (90.5%), meropenem (88.9%), and nitrofurantoin (85.7%) [Figure 1]. Antibiotics to which the isolates were mostly resistant included cefuroxime, gentamicin, and ofloxacin. *E. coli* isolates showed resistance to the commonly prescribed antibiotics; amoxicillin/clavulanate (90%), ciprofloxacin, gentamicin, and cefuroxime.

## IV. Discussion

The study sought to define the urine bacteriology of patients with symptomatic and asymptomatic BPH in our region. Bladder outlet obstruction due to BPH is a major cause of bacteriuria in aging males. This is as a result of increased bacterial colonization of the urinary tract due to stasis and incomplete bladder emptying. Urethral catheterization and cystoscopic evaluation also increase the risk of bacteriuria in these patients. [4]. The higher incidence of bacteriuria noted may be related to the long mean duration of lower urinary tract symptoms in our patients.

The study did not reveal any significant difference between the mean ages of patients with and those without bacteriuria. This is in contrast with findings from previous studies, which noted a higher incidence of bacteriuria in the older males. [6],[7],[10] This finding from the above studies has been partly attributed to the decreasing concentration of prostatic zinc-associated antimicrobial factor and increased alkalinity of urine in elderly males. [5] In addition, there was no significant difference between the mean postvoid residual volumes of patients with and those without bacteriuria. Although men with large postvoid residual volume are at a

greater risk of bacteriuria, there is no consensus on the cut-off value that would predict positive urine culture with sufficient sensitivity and specificity. [11],[12]

Most cases of bacteriuria are caused by organisms in the enteric flora which periodically gain access to the genitourinary tract as a result of the proximity to the anal opening. Upon peri-urethral colonization, uropathogens gain access to the bladder by ascent through the urethra. [13] Other cases of bacteriuria may be caused by cross-contamination from other patients and healthcare personnel or from contaminated hospital materials such as catheters, dressing solutions, beddings, and bed pans. [13]

*E. coli* noted in 71% of the culture positive specimens was the most frequently isolated species. This finding is in keeping with those of previous studies within the region and abroad. [6],[7],[14],[15],[16] Other organisms noted included *Klebsiella*, *Proteus*, *Pseudomonas*, and *Enterobacter* species. The predominant presence of coliform organisms in the processed urine samples suggests that contamination by endogenous bowel flora is a major factor leading to bacteriuria in these aging males. Bacteriuria was monobacterial in 85.7% of cases whereas two different species were isolated from 6 urine samples.

The antibiotic susceptibility testing revealed a high degree of resistance to the cephalosporins and fluoroquinolones. This may have been due to the fact that these antibiotics have been abused in the past as a result of self-medication and inappropriate administration in our region. [17] The incidence of *E. coli* resistance recorded for ciprofloxacin, a fluoroquinolone commonly prescribed for the empiric treatment of UTI, was 75%. Similarly, ciprofloxacin resistance among *E. coli* strains has been on the upward trend over the years in different regions of the world, [18],[19] especially among the aging population. [19],[20] This poses a challenge in the empirical management of patients with UTI.

Newer beta lactam antibiotics such as the carbapenems recorded greater activity against the isolated organisms. These agents are expensive and are not suitable for routine prophylactic use due to cost, need for parenteral administration, and risk of development of resistant pathogens. The isolated organisms were sensitive to nitrofurantoin in 85.7% of cases. This is a relatively cheap antibiotic, available in oral formulations with proven activity against most Gram-negative uropathogens. [21] This finding suggests that there may be a greater role for this agent in prophylaxis and treatment of UTI in our region. A previous study noted an increase in the usage of nitrofurantoin from 14% to 30% in the treatment of uncomplicated UTI within a 5-year period as a result of the outcome of antibiotic susceptibility testing. [22]

The patients with bacteriuria who had clinical and microbiological features of UTI such as dysuria and pyuria received therapeutic doses of antibiotics based on susceptibility testing. The presence of bacteriuria in patients with BPH has been associated with an increased incidence of wound infection and UTI after prostatectomy. [8] However, factors which may play a contributory role include preoperative urethral catheterization, length of surgical procedure, use of bladder irrigation, and antibiotic administration. [7],[23] Though the outcome of bacteriuria in the patients who underwent surgery was not studied, previous studies [7],[24],[25] have shown a reduction in the incidence of bacteriuria after prostatectomy with antibiotic prophylaxis. Pourmand *et al.* noted a reduction of bacteriuria from 15% to 3.3% with antibiotic administration. [7] Another study noted a 62% reduction in the rate of bacteriuria after transurethral resection of the prostate with antibiotic administration. [24]

## V. Conclusion

Bacteriuria is a common finding in patients with symptomatic BPH in our setting. Bacterial isolates were mostly sensitive to newer and more expensive carbapenems, but showed greater resistance to the cephalosporins and fluoroquinolones. Due to its relatively low cost and acceptable susceptibility profile, there may be a greater role for nitrofurantoin in the prophylaxis and treatment of complicated UTI in patients with BPH.

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