

# Evaluation Of Bacteriuria in Benign Prostatic Hyperplasia (BPH) Among Male Patients Attending Tertiary Hospitals in Edo State, Nigeria

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# Abstract

Benign Prostate Hyperplasia (BPH) is a non-malignant condition characterized by the proliferation of prostate cell leading to an increase in prostate size, urethral obstruction and lower urinary tract symptoms, usually around old age due to lower urinary tract symptoms. This study is to determine the aetiological agent and antibiotics sensitivity pattern of organism responsible for bacteriuria in BPH male patients attending Central Hospital and University of Benin Teaching Hospital (UBTH), as tertiary hospitals in Edo State. Structured questionnaires were provided and urine samples were collected, spin and the deposit were used for culture, biochemical and antibiotic sensitivity test. Out of the 340 urine samples examined, 124 (36.5%) patients were positive with BPH. The high frequency among isolates observed was *Escherichia coli* 55(16.1%). The age of the patients was strongly associated with the prevalence of the infection (P- 0.058) while the study areas and residence of the patients were not significantly (p > 0.05) associated with the infection. However, the difference between isolates and susceptibility pattern was strongly statistically associated (p < 0.05). Conclusively, the study found no statistical relationships between socio demographic of participants and bacteriuria among BPH patients attending tertiary heath facilities in Edo State; however, the rate of antibiotic resistance to most of the isolates in our findings is worrisome for antibiotic stewardship.

Keywords: Bacteriuria; Benign Prostate Hyperplasia; CLED agar; Hospital; Male patients

# Introduction

Benign Prostatic Hyperplasia (BPH) is a common condition that occurs with aging male population (Bock-Oruma et al., 2013). It is characterized by progressive enlargement of the prostate and a nonmalignant neoplastic process secondary to increased cellular growth (Chan, 2011). The most common causes of Lower Urinary Tract symptoms (LUTS) is BPH (Barkin 2011). The symptoms are difficulty in urination, frequent need to urinate, difficulty in fully emptying the bladder, straining and dribbling (Chughtai et al., 2011). Bladder Outlet Obstruction (BOO) secondary to BPH is partly due to chronic urinary retention and renal insufficiency which leads to complications like recurrent urinary tract infections, gross haematuria and formation of bladder calculi, kidney stones and kidney failure (Speakman and Cheng, 2014). LUTS correspond to a group of persistent urinary symptoms that occurs among 15% to 60% of men who are older than 40 years of age (Parsons et al., 2008; Parsons, 2010). About half of the male population over the age of 50 years can be diagnosed with histological BPH, and this prevalence increases with age to about 90% over the age of 80 years (Edlin, 2016).

According to Kasper *et al.*, (2005), bacterial presence in the urine within its tract is known as bacteriuria and can result in microbial invasion of the organs responsible for the manufacture (kidney), transport (ureters and urethra) and storage (bladder) of urine. Infection of the kidney is known as pyelonephritis. Infection of the lower urinary tract that involves the bladder is called cystitis while it is called urethritis when the urethra is involved. UTIs occur when normal protective mechanisms fail.

These mechanisms include: dislodging of bacteria during urination, high urea concentration in the urine, antibacterial secretions from the prostate, high urine osmolality and white blood cells (Kasper *et al.*, 2005). Majority of UTI are caused by enteric bacteria that make up the normal gastrointestinal flora. 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 (Shortliffe and McCue, 2002). Infection in the male population remains uncommon until after the fifth decade of life, when enlargement of the prostate begins to interfere with emptying of the bladder (Ryan *et al.*, 2004, Crowford and Dall'Era, 2006).

Macroscopic BPH represents the enlargement of the prostate arising from the stromal and epithelial proliferation. There is no consensus establishing the degree of prostate enlargement required to support the diagnosis of macroscopic BPH. The epidemiology of BPH and prostatitis showing male LUTS has evolved considerably in the recent past (Patel and Kellogg, 2014). Therefore, the bacterial aetiology of LUTS in the patients of BPH and/or prostatitis should be studied extensively which will help the clinicians in proper management of the condition and thus, can curb the danger of the complications associated with it.

# Materials And Methods

# Study area and population

This study was conducted in Central Hospital and University of Benin teaching Hospital Edo state. Central Hospital is situated in Oredo Local Government Area with an area of 249 km<sup>2</sup> and a population of 295, 818 inhabitants, which lies between longitudes  $5^{\circ}$  37E and  $15^{\circ}$  26E; latitude  $6^{\circ}$  19N and  $58^{\circ}$  83N while the University of Benin Teaching Hospital is located in Egor Local Government Area, with a population estimated at 258,442 inhabitants and lies between longitudes  $5^{\circ}$  34E and latitude  $6^{\circ}$  23N (Ministry of Land and Survey, 2008). Ethical approval for this study was obtained from Ministry of Health, Benin City, Edo state with the reference number HM.1208/7461. A total of 340 patients were recruited for this study. Informed consent was received from each patient and structured questionnaires were administered to the patients to obtain their demographic data.

Clean catch midstream urine specimens were collected and processed for culture, sensitivity and biochemical tests. The urine specimens were spin and inoculated unto Cystine Lactose Electrolyte Deficient (CLED) and Blood agar plates using streaking method. The plates were inverted and incubated aerobically at  $37^{\circ}$ C for 24 h. After

the incubation period, plates were examined and identified isolates were subjected to antibiotic susceptibility tests (CLSI, 2007).

# Statistical analysis

Data obtained were analyzed using Chi-square  $(X^2)$  test for frequency distribution and odd ratio analysis for potential risk factors. One-way analysis of variance (ANOVA) and means were compared by Duncan multiple range test (DMRT) using SPSS 19.0 version.

#### Results

A total of 340 patients participated in this study. In Central Hospital two hundred (200) patients were examined and University of Benin Teaching Hospital (UBTH), one hundred and forty (140) patients were examined. Out of the 340 patients' samples examined, 124 (36.5%) were infected with various isolates (Fig 1). From the isolates examined, Escherichia coli had the highest prevalence rate of 55 (16.1%), followed by Staphylococcus aureus 23 (6.8%), Klebsiella species 21 (6.2%), Pseudomonas aeroginosa 13 (3.8%), Providencia species 5 (1.5%), Citrobacter species 3 (0.9%), Proteus vulgaris 3(0.9%) and Alcaligenes species 1(0.3%) Table 1. In relation to age, 70 years and above had a higher prevalence of 47 (81.2%) that was statistically significant (p = 0.058). There was no significant relationship between the parameters (educational status and residence) with the prevalence of the infection (p > 0.05) Table 2. In addition, there was no significant correlation observed in the prevalence of BPH in the study areas (OR = 1.18; 95% CL = 0.782, 1.80; p = 0.459) Table 3. Also, the Escherichia coli isolated showed higher sensitivity to imipenem antibiotic and highly resistance to cephalosporins and fluoroquinolones antibiotics (Fig 2).

#### Discussion

Benign prostatic hyperplasia (BPH) is excessively common in males, approximately 50% in people aged 50 years old, and as high as 90% in those aged 90 years old (Unnikrishnan *et al.*, 2017). Half of the patients with BPH are complicated with progressive urinary tract irritation or lower urinary tract symptoms (LUTS), which are manifested by irritative symptoms of bladder such as urgent urination and painful urination, micturition and obstruction symptoms such as residual urine and urinary retention (Na *et al.*, 2017; Unnikrishnan *et al.*, 2017).

An overall prevalence of 36.5% of bacteriuria was observed among BPH patients in this study. This is higher than the 20.6% observed in Spain (Soler *et al.*, 1999) and 23.7% in Nigeria (Ojewola *et al.*, 2017). However, it agrees with Oshodi *et al.*, 2015, in which the reported prevalence was 33.0%. It is lower than that observed by Agbuigui *et al.* (2016) that reported the prevalence of 44.7% in Nigeria. The observed difference could be due to or associated with prolong lower urinary symptoms in the patients. Oshodi *et al.* (2014) had also, reported the association between BPH and UTI with prolong lower urinary symptoms in the patients and variability in age difference.

The present study revealed *Escherichia coli* 55 (16.1%) as the most isolated and the principal leading cause of lower urinary tract symptoms (LUTS) in BPH patients followed by *Staphylococcus aureus* 23(6.8%), *Klebsiella* species 21(6.2%) and *Pseudomonas aeruginosa* 13(3.8%) respectively. This aligns also with Oshodi *et al.* (2015) which states that the Enterobacteriaceae, in particular *E. coli*, are the predominant pathogens in bacterial prostatitis (acute and chronic) while the other studies on bacteriuria and BPH also shows *E. coli* as a prime pathogen followed by other bacteria but with some more aetiological agents (Oshodi *et al.*, 2015; Sarah *et al.*, 2015). A similar aetiology has also been reported by a study from Babylon, Iraq in 2009 (Hussein, *et al.*, 2009).



Fig 1: The prevalence of bacteriuria in BPH patients in the study area



Fig 2: Antimicrobial susceptibility pattern

Isolated nathogens	Number infected
Escherichia coli	55(16.1)
Staphylococcus aureus	23(6.8)
Klebsiella pneumonia	21(6.2)
Pseudomonas aeruginosa	13(3.8)
Providencia spp	5(1.5)
Citrobacter spp	3(0.9)
Proteus vulgaris	3(0.9)
Alcaligenes spp	1(0.3)

Table 1: Prevalence of bacteria uropathogens among BPH patients in study area (n=124).

Table 2: Socio - demographic characteristics of participants

Variables	Number examined	Number Infected (%)	P – value
Age group			
40-49	78	24 (30.8)	0.058
50 - 59	83	26 (31.3)	
60 -69	67	27 (40.3)	
70 -80	83	36 (43.3)	
>80	29	11 (37.9)	
Education			
Primary	29	10 (34.4)	0.962
Secondary	242	86 (35.5)	
Tertiary	69	28 (40.6)	
Residence			
Urban	225	76 (33.3)	0.96
Semi urban	90	34 (37.8)	
Rural	25	14 (56.0)	

The findings that age significantly affect the prevalence of bacteriuria in BPH patients agrees with a previous report by Oshodi *et al.* (2014). The highest distribution of isolates with age was found to be between the age group 70 - 80 years 47(81.2%) and the least 24(30.8%) among age group 40 - 49 years. The difference between age and the isolates can be deducted from the decline in immunity at old age. The study found no statistically significant difference between isolates distribution and educational status of BPH patients. The prevalence of infected patient 28 (40.6%) was found among tertiary status holders followed by secondary, 86 (35.5%) and the least was primary 10 (34.4%). However, there were paucity of literature on the relationship between urinary tract infection and educational status of patients.

Table 3: Prevalence of bacteriuria in relation to hospitals studied

Location	Number Examined (%)	Number infected (%)	Odd ratio	CL	P - value
UBTH	200 (74.63)	68 (25.37)	1.18	0.782 to 1.80	0.459
Central Hospital	140 (71.43)	56 (28.57)			
Total	340	124			

In relation to the area of residence, patients in the rural area had the higher prevalence of (56%) than the other study areas but no statistical difference observed. The disparity in this observation may be due to lack of education and awareness on the causes of bacteriuria, patients having difficulty in urination or slow urination, painful urination or retaining urine in the bladder for a long time.

Subsequently, Central hospital had a higher prevalence compared to UBTH though there was no significant difference. This may be as a result of the financial status of the patients that attend Central hospital which is a state government hospital and less expensive.

The antibiotic susceptibility testing revealed a high degree of resistance to the cephalosporins and fluoroquinolones. This may indicate that these antibiotics have been abused in the past as a result of self-medication and inappropriate administration (Okeke *et al.*, 1999). Also, as fluoroquinolones is commonly prescribed for the empiric treatment of Urinary Tract Infection. Similarly, fluoroquinolones resistance among *E. coli* strains has been on the upward trend over the years in different regions of the world (Arslan *et al.*, 2005; Vellinga *et al.*, 2012) especially among the aging population (Karlowsky *et al.*, 2001; Arslan *et al.*, 2005). The carbapenems antibiotic recorded greater activity against the isolated organisms. This agrees with the previous studies of Agbugui *et al.*, (2016). These antibiotics are

expensive and not suitable for routine prophylactic use. However, these findings suggest better antibiotic selection in prophylactic and empirical treatment of UTI during management.

# Conclusion

This study found no statistical relationship between socio-demographic and socio-economic factors and bacteriuria in BPH patients attending tertiary health facilities in Edo State. However, measures to reduce resistance to the management of UTI are advocated.

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