



## Occurrence of Asymptomatic Bacteriuria amongst Inmates of Federal Neuropsychiatric Hospital Calabar, Nigeria

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### Authors' contributions

This work was carried out in collaboration between all authors. Authors PCIE and SUR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author UGE managed the analyses of the study. Author IBOB managed the literature searches. All authors read and approved the final manuscript.

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### ABSTRACT

**Aims:** To determine the occurrence and prevalence of asymptomatic bacteriuria, influence of gender and duration of illness on the prevalence of this infection among inmates of Federal Neuropsychiatric Hospital, Calabar.

**Study Design:** This was a cross sectional study. Ethical approval was obtained, consent forms were signed by the patients, questionnaires were also administer followed by collection and processing of clean catch mid-stream urine specimens.

**Place and Duration of Study:** The study was carried out at Federal Neuropsychiatric Hospital Calabar, Nigeria between August, 2010 and September, 2011.

**Sample:** Urine samples from two hundred (200) inmates and one hundred (100) apparently healthy staff of the same hospital (control subjects).

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**Methodology:** Urine samples were collected in sterile universal bottles and analyzed using standard laboratory diagnostic techniques and cultured using Lee and Williams technique. The modified Kirby-Bauer sensitivity testing technique was used for antimicrobial testing of the isolates.

**Results:** Significant bacteriuria was established in 60(30%) of the inmates while only 8(8%) of the control subjects had bacteriuria. The difference in infection between the inmates and the control subjects was statistically significant ( $P = 0.001$ ). Females 40(40%) were more infected than male subjects 20 (20%) but this was not statistically significant ( $P = 0.052$ ). Inmates with 16-20 weeks of duration of mental disease had the highest level of infection 4(40%) while inmates with 1-5 weeks of duration of mental disease had the lowest level of infection 12(28%) and this was statistically significant ( $P = 0.001$ ). The most common urinary pathogens isolated amongst both the test and control subjects were *Escherichia coli* (34) followed by *Proteus* spp (14) while *Staphylococcus saprophyticus* was the least isolated organism.

**Conclusion:** This work has shown that asymptomatic bacteriuria is common among inmates of Federal Neuropsychiatric hospital, Calabar and the need to put in place strategies to control this infection among this category of patients in the study area.

**Keywords:** *Inmates; neuropsychiatric hospital; bacteriuria; Calabar.*

## 1. INTRODUCTION

Surveillance of infections in psychiatric hospitals has faced operational difficulties owing to the required strategies based on available standard criteria to the unique needs of these patients population [1]. Some epidemiologic studies of infections in hospitals reported that the bacteriuria is the most frequent infections in psychiatric inpatients [2-4]. Factors associated with bacteriuria include age, gender, type of psychiatric disease, use of invasive devices such as catheter, and recently genetic background has been considered [5]. Application of antimicrobial agents for treatment of UTIs produces clinically relevant adverse reaction because of their interactions with psychotropic drugs prescribed to psychiatric patients [5]. The results from a survey to estimate the prevalence of health care associated infections (HAI) indicated that bacteriuria was the most common type of HAI in acute and non-acute hospital inpatients; moreover, in non-acute hospital, 5% of psychiatric inpatients were affected by a HAI [3]. According to a prevalence survey done in Norway of infections among hospitalized patients, the psychiatry ward presented the lowest rate of hospital infections and the bacteriuria was the most common infections among inpatients [6]. This study was carried out to determine the occurrence and prevalence of asymptomatic bacteriuria among inmates of Federal Neuropsychiatric Hospital, Calabar with a view to suggesting new strategies to improve the management of these patients in the study area.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

This study was carried out between August, 2010 and September, 2011 in Federal Neuropsychiatric Hospital, Calabar. This hospital is located in the centre of Calabar, the capital city of Cross River State, where people with mental illness within the state and the neighbouring cities come for treatment.

### 2.2 Subjects and Consent

A total of 200 subjects aged 15 to 50 years who were confirmed by the attending physicians to be approachable i.e. those inmates who can be asked to perform certain task and they will oblige and 100 apparently healthy staff of the hospital (control subjects) were investigated. Ethical clearance was sought and obtained from the ethical committee of the hospital. Informed consent was also sought and obtained from the patient (or patient's relations for those below 18 years) before inclusion in the study. The harmless nature and advantage of the research was also explained to each patient or their relation.

### 2.3 Collection of Samples

Patients after due counseling were enrolled consecutively for the study. Sterile universal bottles were issued to each subject for the collection of clean catch mid-stream urine specimen.

## 2.4 Questionnaire Administration

Questionnaires were also administered to each of the subjects for the following information; prior history of bacteriuria, antibiotic usage, gender and duration of mental disease.

## 2.5 Processing of Urine Samples

Each urine specimen was cultured onto cysteine lactose electrolyte deficient agar (CLED) and blood agar using Lee and Williams's method [7]. Specimens were also examined both macroscopically and microscopically. Gram stain and standard biochemical tests were used to identify the organisms on the differential media. *Staphylococcus aureus* was identified using catalase and coagulase tests including Mannitol salt agar as described by Cowan and Steel [8]. *Escherichia coli* was identified using indole reaction in peptone water and Kligler's iron agar medium as described by Cowan and Steel [8].

The modified Kirby-Bauer sensitivity testing technique was used for antimicrobial testing of the isolates [9]. Organisms showing significant bacteriuria of  $10^5$ CFU/ $\mu$ l were inoculated into peptone water to match 0.5 Mcfarland turbidity standards ( $1.5 \times 10^8$  bacteria/ml) before spread plating on Muller Hinton Agar. Commercially prepared antimicrobial discs of known minimum inhibitory concentrations (MIC) were placed aseptically on the surface of the sensitivity agar after drying sufficiently and pressed down with sterile forceps to make enough contact with the agar. The plates were incubated at 37°C for 24 hours and the zones of growth inhibition determined. Thereafter sensitivity to a particular antibiotic was determined if the diameter of its zone of inhibition by a drug was greater than, equal to, or not more than 4mm less than that on the control culture [10]. The following antimicrobial sensitivity discs were used; Septrin (30  $\mu$ g), Chloramphenicol (30  $\mu$ g), Sparfloxacin (10  $\mu$ g) Amoxicillin (30  $\mu$ g) Augmentin (30  $\mu$ g), Gentamycin (10  $\mu$ g), Ofloxacin (30  $\mu$ g), and Streptomycin (30  $\mu$ g), Ciprofloxacin (10  $\mu$ g), Refloxacin (10  $\mu$ g).

## 2.6 Data Analysis

Statistical analysis was performed using a commercial statistical package: SPSS version 16.0 for windows and Microsoft Excel Tool Pak (SPSS for Windows: SPSS Benedeux, Gorinchem, Netherlands). The Chi-squared ( $X^2$ ) test was used to test the variables according to

age and gender. P-values < 0.05 were considered significant while  $P > 0.05$  were considered not significant.

## 3. RESULTS

Out of the 200 subjects in the test group, 60(30%) had bacteriuria while 8 (8%) of the subjects in the control group had infection. Table 1 shows the prevalence of bacteriuria among subjects examined. The highest rate of infection in test group (71.4%) and control group (16.7%) were in age group 36-40 and 31-35 years, respectively. The lowest prevalence of infection in test subjects (0%) occurred in age group 21-25 while that of the control subjects occurred in the age groups 15-20, 36 – 40, 41 - 45 and 46-50 years, respectively. There was statistically significant difference between the occurrence of infection in the test subjects and in the control subjects ( $X^2 = 21.585$ ,  $df = 6$ ,  $p = 0.001$ ). The prevalence of bacteriuria among patients examined by gender is shown on Table 2. The highest prevalence of infection occurred in females (40%) while males had (20%). There was no statistically significant difference between the occurrence of infection in females and males ( $X^2 = 3.778$ ,  $df = 1$ ,  $p = 0.052$ ).

Table 3 shows the distribution of organisms isolated among test and control subjects examined. *Escherichia coli* has the highest frequency (88.2%) followed by *Proteus* spp (85.7%), *Pseudomonas aeruginosa* (83.3%), *Klebsiella* spp (85.7%), *Pseudomonas aeruginosa* (83.3%), *Klebsiella* spp and *Staphylococci sapropticus* has the lowest frequency but high percentage of (100%) respectively.

Fig. 1 shows the sensitivity pattern of all the bacterial isolates from the inmates. All the bacteria isolates were 100% sensitive to Ofloxacin except *Pseudomonas aeruginosa* which had 80% sensitivity level. *Pseudomonas aeruginosa* was resistant to Nitrofurantoin, septrin and ampicillin while *Proteus* was resistant to septrin and ampicillin. In all Ofloxacin, peflacine and ciprofloxacin showed a reasonable level of sensitivity (> 70%). Fig. 2 shows the prevalence of urinary tract infection in relation to the duration of mental disease among test subjects. The highest prevalence of infection occurred among test subject with duration of mental disease range 16-20 weeks (40%) while the lowest occurred in the range 1-5 weeks (28.6%). There was a statistically significant

difference between occurrence of infection and duration of mental disease ( $X^2 = 180.0$ ,  $df = 3$ ,  $p = 0.001$ ).

#### 4. DISCUSSION

Bacteriuria was bacteriologically confirmed in 30% of subjects examined. This further confirms the report that high prevalence of bacteriuria is usually associated to mental conditions like changes in level of consciousness, periods of altered perception, disorganized speech, or

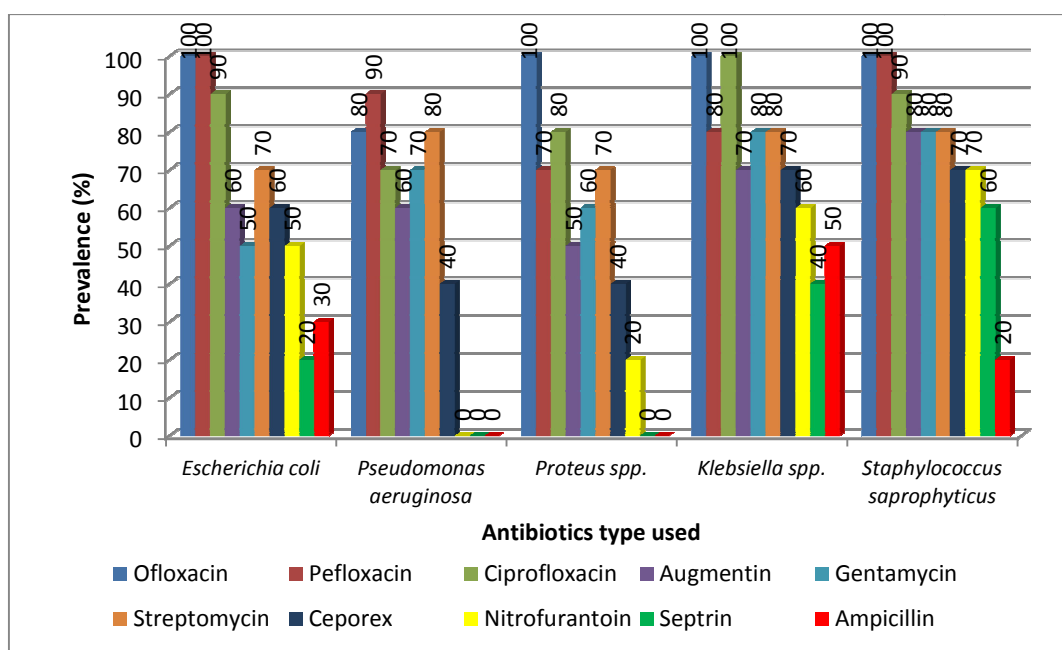
lethargy [11]. The high prevalence of bacteriuria observed in this study may be as a result of the effect of the underlying host factors that complicate UTI in psychiatric conditions like lethargy, anxiety and Alzheimer disease and also genetic factors that may be involved in bacteriuria present in patients with mental problems [5]. This 30% prevalent rate in the test subjects was statistically significant compared to the 8% in the control subjects enrolled in this study.

**Table 1. Prevalence of bacteriuria among subjects examined by age**

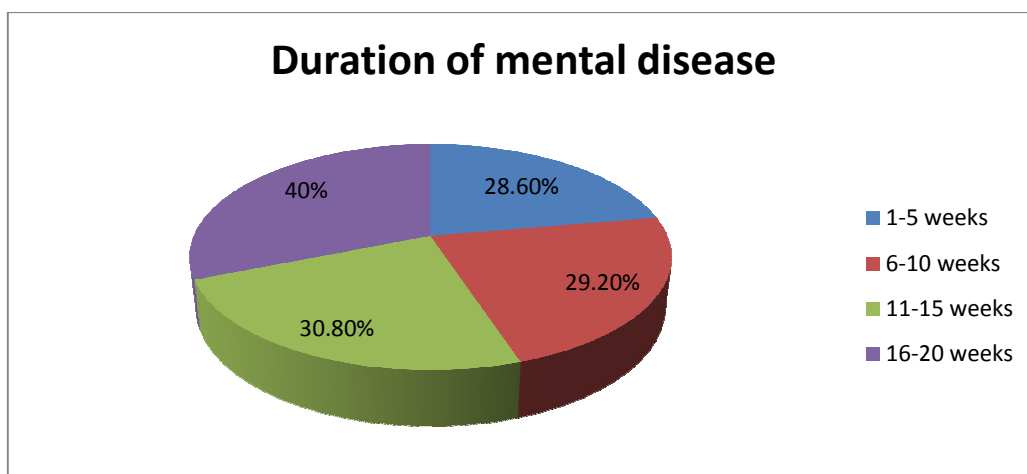
Age group (years)	Test subjects		Control subjects	
	No. examined	No. (%) with infection	No. examined	No. (%) with infection
15-20	20	4(20)	22	0(0.0)
21-25	36	0(0.0)	26	2(7.7)
26-30	48	12(25)	36	4(11.1)
31-35	36	20(55.6)	12	2(16.7)
36-40	28	20(71.4)	4	0(0.0)
41-45	16	2(12.5)	0	0(0.0)
46-50	16	2(12.5)	0	0(0.0)
Total	200	60(30)	100	8(8.0)

**Table 2. Prevalence of bacteriuria among subjects examined by gender**

Sex	Test subjects		Control subjects	
	No. examined	No. (%) with infection	No. examined	No. (%) with infection
Males	100	20(20)	50	0(0.0)
Females	100	40(40)	50	8(16)
Total	200	60(30)	100	8(8.0)



**Fig. 1. The sensitivity pattern of all the bacterial isolates from the inmates**



**Fig. 2. Prevalence of bacteriuria among subjects examined according to duration of mental disease**

**Table 3. Distribution of organisms isolated among test and control subjects examined**

Organisms isolated	No. of organisms isolated	No. (%) of organisms isolated	
		Test subjects	Control subjects
<i>Escherichia coli</i>	34	30(88.2)	4(11.8)
<i>Pseudomonas aeruginosa</i>	12	10(83.3)	2(16.7)
<i>Proteus spp</i>	14	12(85.7)	2(14.3)
<i>Klebsiella spp</i>	6	6(100)	0(0.0)
<i>Staphylococci saprophyticus</i>	2	2(100)	0(0.0)
Total	68	60(88.2)	8(11.8)

The prevalence of bacteriuria among patients examined by age showed a higher rate of infection among the age group 26-40 years; this may probably be due to the fact that this age bracket are active in terms of sexual intercourse which is common among people of this age range [12]. Prevalence of bacteriuria among patients examined by gender, showed a higher prevalence in females than in males and this was statistically significant. This is in agreement with other reports which stress that bacteriuria is more frequent in females than males [13,14] and also probably due to the proximity of female urethra to the anal region. The duration of illness of psychiatric patients has a significant role in contributing to the bacteriuria, because it has shown in this study that patients with long duration of mental disease 16 – 20 weeks (40%) have more infection than those with shorter duration 1- 5 weeks (28.6%). The organism may have been self introduced by the patients or introduced into the urinary tract through invasive means [15]. *Escherichia coli*, *Proteus spp* and *Pseudomonas aeruginosa* were the commonest bacterial organisms isolated. This can be compared to that of Gabastou et al. [16] and Sáinz et al. [17] who reported the most frequently

isolated bacteria strains in psychiatric patients with UTIs to include *Escherichia coli*, *Proteus mirabilis* and *Klebsiella spp*. This finding is also similar to other reports which indicated that *Escherichia coli* were the commonest pathogen isolated in patients with bacteriuria [14,18]. It has also been reported that *Escherichia coli*, *Pseudomonas aeruginosa*, *Proteus vulgaris* are normal flora of the gastro intestinal tract and so could easily contaminate the urinary tract [15]. The antibiotic sensitivity test reveals resistance to most of the commonly used antibiotics like ampicillin, septrin and gentamycin which can be easily bought across the counter in this environment. This resistance may be as a result of drug abuse or exposure of the subjects to similar drugs while they were walking free on the streets with the mental disease.

## 5. CONCLUSION

This work has shown that bacteriuria is common among inmates of Federal Neuropsychiatric hospital, *Escherichia coli*, *Proteus spp* and *Pseudomonas aeruginosa* were the commonest bacterial organisms isolated and females were more infected probably due to the proximity of

their urethra to the anal region. We therefore recommend the need to put in place strategies to control this infection among this category of patients.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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