



## Asymptomatic Bacteriuria amongst Geriatrics in Calabar, Cross River State, Nigeria

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### Authors' contributions

This work was carried out in collaboration between both authors. Author PCIE designed the study, performed the literature search, performed the statistical analysis, arranged and presented the manuscript. Author UECE administered the questionnaires; collection and processing of clean catch mid-stream urine specimens. Both authors read and approved the final manuscript.

### Article Information

DOI:10.9734/BJMMR/2015/18942

#### Editor(s):

- (1) Roberto Manfredi, Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy.  
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(2) Anonymous, Brasil.  
(3) Ilham Zahir, University Sidi Mohamed Ben Abdellah, Morocco.

Complete Peer review History: <http://sciencedomain.org/review-history/10008>

Original Research Article

Received 18<sup>th</sup> May 2015  
Accepted 23<sup>rd</sup> June 2015  
Published 2<sup>nd</sup> July 2015

### ABSTRACT

**Aims:** To investigate the prevalence of asymptomatic bacteriuria among Geriatric patients in Calabar, the predisposing factors associated with this infection, the incriminating bacterial pathogens and their antibiotic susceptibility pattern.

**Study Design:** Ethical approval, consent from the patients, questionnaire administration, collection and processing of clean catch mid-stream urine specimens.

**Place and Duration of Study:** Calabar, the capital city of Cross River State, Nigeria between May, 2014 and February, 2015.

**Methodology:** Urine samples from randomly selected 200 subjects (92 men and 108 women) between the ages of 60 to 90 years were cultured by Leigh and Williams's method. Questionnaires were also administered.

**Results:** 92 (46%) subjects had asymptomatic bacteriuria. Subjects between the age group 71 – 75 years had the highest level of infection but the difference was not statistically significant (P=0.165). Females 52 (48.1%) were more infected than the males 40 (43.4%) but this was not

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statistically significant ( $p=0.641$ ). Among the diabetics only 22 (47.8%) had infection while 20 (41.6%) hypertensive subjects had infection. There was a negative correlation between diabetic subjects and the presence of infection ( $r=-0.2$ ) and also a negative correlation between the hypertensive subjects and the presence of infection ( $r=-0.3$ ). *Escherichia coli* 24 (26.1%) and *Proteus spp* 24 (26.1%) were the most commonly isolated bacteria.

**Conclusion:** This work revealed a high prevalence rate of asymptomatic bacteriuria among geriatric subjects in Calabar but no association between infection and diabetes or hypertension was observed.

**Keywords:** Asymptomatic bacteriuria; geriatrics; diabetes; hypertension; Calabar.

## 1. INTRODUCTION

Asymptomatic bacteriuria is common among elderly persons [1]. Urinary tract infections are regarded to be complicated in men [2]. A prevalence of asymptomatic bacteriuria in female geriatric patients in residents of homes for the elderly has been observed to be between 25% to 50% and even rising to 100% in catheterized patients [2]. Female patients with medically treated diabetes is also said to frequently exhibit a urinary tract infection [3]. Aging contributes to an increased risk of urinary tract infection. Estrogen deficiency probably explains the higher rates in women. Older men have less bactericidal secretions in their prostatic secretions than younger men, increased residual volume, prostrate growth in men, incomplete voiding, a higher rate of diabetes and central nervous diseases such as Alzheimer disease or Parkinson disease also contribute [4]. Asymptomatic bacteriuria does not progress to renal insufficiency or hypotension in elders in the absence of obstruction. It frequently resolves spontaneously with replacement by different organisms, or the same organism with different antibiotic susceptibilities [2]. There is an increased risk of urinary tract infection (i.e. positive urine cultures with symptoms) in elders with asymptomatic bacteriuria but this rarely progresses to pyelonephritis. The most effective ways to reduce bacteriuria are to avoid urinary catheters and ensure good fluid intake [2]. This work was to establish the current prevalence of asymptomatic bacteriuria among Geriatrics patients in Calabar, the risk and predisposing factors associated with this infection, the incriminating bacterial pathogens and their antibiotic susceptibility pattern.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

This study was carried out between May, 2014 and February, 2015 in Calabar, the capital city of

Cross River State, Nigeria. Calabar has a population of 371,022 according to 2006 census [5]. The University of Calabar Teaching Hospital (UCTH) and the General Hospital (GH), Calabar provide tertiary and secondary health care needs of the people living in the state. However there are about eighteen (18) private clinics that provide supportive health care to patients. The city is within the rain forest belt of Nigeria two seasons; the dry season and rainy season. The region has a rainy season from April until October, and dry season from November to March. It has a relative humidity between 80% and 100% during rainy season. Average temperature ranges from 24°C (75°F) on August to 30°C (86°F) in February. Residents are mostly civil servants, trader of various cadres, farmers and artisan. It's inhabited by different tribes; the Efiks, Ibibios, Annangs, Igbos, Hausas, Yorubas, Cameroonians and others.

### 2.2 Subjects

A total of 200 elderly people from the age of 60 years to 100 years who live in both South and North of Calabar metropolis were recruited for the studies. Subjects were recruited based on simple random sampling method.

### 2.3 Study Design

The under listed sequence of activities were followed

- Seeking and obtaining of Ethical approval.
- Inform consent from the subjects which explained the detail procedure of the study
- Questionnaire administration.
- Collection and processing of clean catch mid-stream urine specimens.

### 2.4 Ethical Consideration

Ethical clearance was sought and obtained from Ethical committee of University of Calabar

Teaching Hospital (UCTH), Calabar. Informed consent in the form of a signed consent was sought and obtained from the patients or other relation in situation where the patient cannot sign the consent form.

## 2.5 Questionnaire Administration

Questionnaires were also administered on each of the subjects for the following information; prior history of UTI, antibiotic usage, marital status, age, sex, history of prostatitis, urinary retention or renal calculi, history of Parkinson disease, cerebrovascular disease, diabetics, catheter, hypertension and occupation to help in the research process.

## 2.6 Inclusion Criteria

Elderly without symptoms of urinary tract infection, known diabetes and hypertensive were also included in the research.

## 2.7 Exclusion Criteria

Subjects who reported signs and symptoms of UTI like dysuria, incontinence, frequency, urgency, suprapubic pain or flank pain and those currently on antibiotic therapies, were excluded from the research.

## 2.8 Sample Collection

Standard laboratory quality procedures were adhered to in all aspect of the study and approved guidelines for collection of urine samples by CLSI, 2001 was adopted [6].

Sterile universal bottles were issued to each subject for the collection of clean catch mid-stream urine specimens. Clean catch early morning mid-stream urine for microbiological examination was collected from subject of the elderly population (from 60 years and above). The need to collect the urine with as little contamination as possible was explained to the subjects. Female patients were told to clean the area around the urethral opening with clean water, dry the area and collect the urine with the labia held apart. Male patients were told to wash the hands before collecting a specimen. They were told to allow the first part of urine pass out into toilet, then stop the urine flow and position the container and collect the mid-stream portion of the urine, then finish urinating into the toilet. The container was labelled with date, name, sex and age.

## 2.9 Processing of Urine Samples

Each urine specimen was cultured into Cysteine Lactose Electrolyte Deficient agar (CLED) and Blood agar (BA) using Lee and Williams' 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. The media used included Sabouraud agar, serum and corn meal agar for identification of *Candida albicans*. *Staphylococcus aureus* was identified using catalase and coagulase tests including Mannitol salt agar as described by [8]. *Escherichia coli* was identified using indole reaction in peptone water and Kligler's iron agar medium as described by [9].

The modified Kirby-Bauer sensitivity testing technique was used for antimicrobial testing of the isolates [10]. 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 or equal to 4 mm less than that on the control culture [9]. 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), Streptomycin (30  $\mu$ g), Ciprofloxacin (10  $\mu$ g) and Refloxacillin (10  $\mu$ g).

## 2.10 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

Table 1 shows the prevalence of asymptomatic bacteriuria according to age group of subjects examined. Subjects in the age group 71 – 75years had the highest prevalence 22 (73.3%) rate while subjects in the age group 81 – 85years had the lowest prevalence rate 8 (28.5%). The difference was not statistically significant ( $X^2 = 7.847$  df (5)  $P=0.165$ ). The prevalence of asymptomatic bacteriuria among subjects examined by gender is shown in Table 2. Female had a higher prevalence rate 52 (48.1%) than males 40 (43.4%). The difference was not statistically significant ( $X^2 = 0.218$ ; df (1)  $P=0.641$ ).

Table 3 shows the prevalence of asymptomatic bacteriuria amongst diabetic and hypertensive subjects examined by age group. Diabetic patients in the age group 76-80 years had the highest prevalence rate 6 (75%) while those in the age group 81-85 years and 86-90 years had the lowest 4 (33.3%) and 2(33.3%) respectively.

Among the hypertensive patients in the age group 76-80 years had the highest rate of infection 6 (100%) and 2 (100%) respectively while those in the age group 66-70years had the lowest prevalence rates 4 (40%). Infected versus diabetic patients were very weakly negatively correlated ( $r= -0.2$ ) and infected versus hypertensive patients were also very weakly negatively correlated ( $r= -0.3$ ). Bacteria isolated from subjects with asymptomatic bacteriuria are shown in Table 4. *Escherichia coli* 24 (26.1%) and *proteus species* 24 (26.1%) were the highest isolates while *Klebsiella spec ies* 10 (10.9%) were the lowest isolates. Fig. 1 shows the sensitivity pattern of all isolated organisms from the subjects. All the isolates were sensitive to levofloxacin (100%) but less sensitive to Gentamycin (28.6%). *Staphylococcus aureus* (57%) and *Escherichia coli* (46%) were more sensitive to Nitrofurantoin while *Klebsiella species* (20%), *Pseudomonas aeruginosa* (10%), *Proteus species* (8.3%), were less sensitive to Nitrofurantoin.

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

Age group (years)	Number examined	Number with infection (%)
60 – 65	36	16 (44.4)
66 – 70	44	18 (40.9)
71 – 75	30	22 (73.3)
76 – 80	38	14 (36.8)
81 – 85	28	8 (28.5)
86 – 90	24	14 (58.3)
Total	200	92 (46)

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

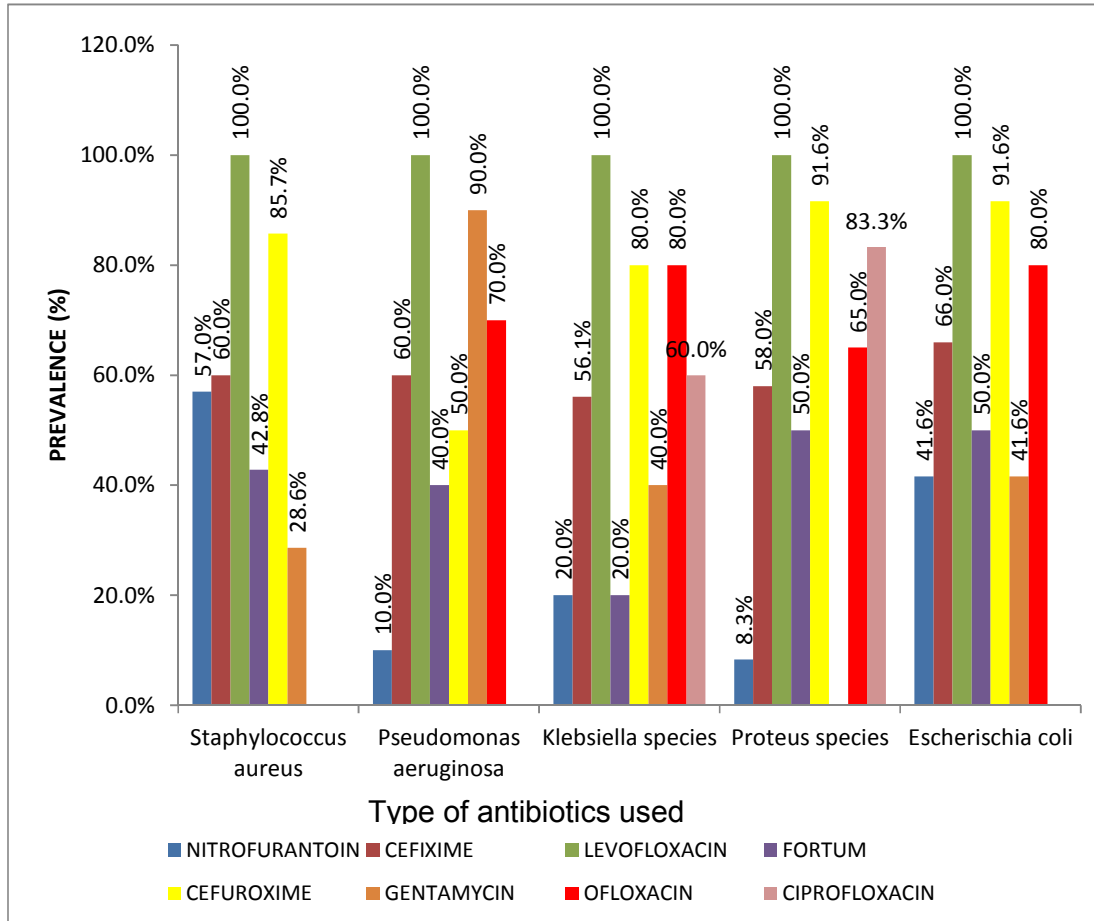
Sex	Number examined	Number (%) with infection
Male	92	40 (43.4)
Female	108	52 (48.1)
Total	200	92 (46)

**Table 3. Prevalence of asymptomatic bacteriuria amongst diabetic and hypertensive subjects examined by age group**

Age group (years)	Number examined	Number with diabetes	Number (%) with infection	Number with hypertension	Number (%) with infection
60 – 65	36	12	6 (50)	6	6 (100)
66 – 70	44	6	4 (66.6)	10	4 (40)
71 – 75	30	2	-	8	4 (50)
76 – 80	38	8	6 (75)	2	2 (100)
81 – 85	28	12	4 (33.3)	10	-
86 – 90	24	6	2 (33.3)	12	4 (33.3)
Total	200	46	22 (47.8)	48	20 (41.6)

**Table 4. Bacteria isolated from subjects with asymptomatic bacteriuria**

Bacteria isolated	Number (%) of subject with isolates-
<i>Escherichia coli</i>	24 (26.1)
<i>Staphylococcus aureus</i>	14 (15.2)
<i>Proteus species</i>	24 (26.1)
<i>Klebsiella species</i>	10 (10.9)
<i>Pseudomonas aeruginosa</i>	20 (21.7)
Total	92 (100)



**Fig 1. Sensitivity pattern of different bacteria isolates**

**4. DISCUSSION**

The elderly ranges from individuals living in the community who is clinically well, economically independent, and fully functional to the completely impaired resident in the nursing home who is non communicative, immobile, incontinent, and requires nutritional support through a feeding tube. Bacteriuria without symptoms of urinary tract infection is a common finding in elderly people living in the community [11].

Asymptomatic bacteriuria is frequent in elderly patients and even more prevalent in residents of long health term care facilities and is becoming increasingly important [12].

Out of the 200 elderly male and female subjects examined, 46% had asymptomatic bacteriuria. This can be compared to the 40% reported by Nicolle, 2005 [1] in America, 47% by Blocklehurst et al. [13] but higher than 10.9% reported by Ahmad et al. [14] in Iran. Females had a higher prevalence rate 52 (48.1%) than males 40

(43.4%) though the difference was not statistically significant ( $p=0.641$ ). Our study is lower than 19 (65.5%) and 10(34.5%) reported by Ahmad et al. [14] among elderly women and men respectively in Iran. However, our study is higher than 22.4% and 5.4% reported amongst elderly women and men respectively in America by Kaye et al. [15]. Nicolle et al. [1] had also stated that the prevalence rate of asymptomatic bacteriuria in elderly female is higher than in elderly male in America.

Subjects in age group 71-75 years had the highest prevalence 22 (73.3%) of infection but the difference was not statistically significant ( $p=0.165$ ). This is in contrast to the 55.1% reported by Ahmad et al. [14] in Iran where majority of the infection was observed in people aged 60-70 years. Also, subjects in the age group between 81-85 years were reported to have had the lowest prevalence rate 8 (28.5%). This can be compared with subjects in the age group 81-90 years which had similar prevalence 4 (30.2%). Results of this study did not show any increase in infection with corresponding age. This is in contrast to that of Hedin et al. [17], who reported that the prevalence of asymptomatic bacteriuria progresses with increasing age.

The prevalence of asymptomatic bacteriuria in diabetic patient was also studied; out of the 200 Geriatric subjects examined, 46 had diabetes and 22 (47.8%) were positive for asymptomatic bacteriuria. It was reported by Yohanes [16] that diabetes mellitus increases the risk of asymptomatic bacteriuria by potentially causing neurogenic bladder, diabetic microangiopathy and impaired immune system for hyperglycaemia but this study did not reveal any positive correlation between diabetes mellitus and asymptomatic bacteriuria  $r= -0.2$ . Hypertensive subjects had 20 (41.6%) asymptomatic bacteria (Table 3). There was negative correlation between hypertensive patients and the presence of infection ( $r= -0.3$ ).

*Escherichia coli* and *Proteus specie* were the most prevalent bacterial isolate with a prevalence rate of 24 (26.1%). This can be compared with that of Hedin et al. [17], 2002 who reported these two organisms as the major bacterial agent isolated from asymptomatic bacteriuria in elderly population. This was followed by *Pseudomonas aeruginosa* 20 (21.7%), *Staphylococcus aureus* 14(15.2%) and *Klebsiella specie* 10 (10.9%) sequentially. This can be compared to that reported by Ahmad et al. [14] who reported that

*Escherichia coli* (31%) was the most isolated bacterial pathogen followed by *Klebsiella spp* (17.2%), *Staphylococcus aureus* (6.9%), *Pseudomonas aeruginosa* (3.4%).

All the isolates were sensitive to levofloxacin (100%) sensitivity but all were resistant to augmentin. *Staphylococcus aureus* was sensitive to Gentamycin (28.6%), *Pseudomonas aeruginosa* was sensitive to Nitrofurantoin (10%), *Escherichia coli* was sensitive to Nitrofurantoin and Gentamycin (41.6%), *Klebsiella specie* was sensitive to nitrofurantoin and fortum (20%), *Proteus specie* was sensitive to Nitrofurantoin (8.3%). The groups of fluoroquinolones antibacterial used as the first line of antibiotic therapy in the elderly population [18]. Treatment of asymptomatic bacteriuria with antibacterial agent does not decrease morbidity and mortality of asymptomatic bacteriuria and bacteria will only temporarily be eliminated, but leads to increased antibiotic resistance [1].

## 5. CONCLUSION

This work has revealed a high rate of asymptomatic bacteriuria among geriatric subjects in Calabar and the need to put in place necessary health infrastructure to screen this category of patients in order to improve their health status because early recognition and management of various risk factors of asymptomatic bacteriuria is very important to potentially reduce its occurrence.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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