Epidemiological Studies of Urinary Tract Infection (UTI) among Post-menopausal Women in Uyo Metropolis, South-South, Nigeria.

[1]Akinjogunla, O. J., [2]Odeyemi, A. T. and [3]Olasehinde, G. I.

[1]Department of Microbiology, Faculty of Science, University of Uyo, P.M.B. 1017, Uyo, Akwa Ibom State, Nigeria.
[2]Department of Microbiology, Faculty of Science, University of Ado-Ekiti, P.M.B.5363, Ado-Ekiti, Ekiti State, Nigeria.
[3]Department of Biological Sciences, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria.
papajyde2000@yahoo.com

ABSTRACT: Cross-sectional studies of UTI among post menopausal women were carried out between January and June, 2009 using standard microbiological techniques. The result obtained showed that 42 (39.6%) out of 106 postmenopausal women had urinary tract infections with highest prevalence among women aged 56-60 and lowest among those aged ≥ 61 . Microscopic examinations of forty-two (42) mid-stream urine samples revealed the presence of 13(30.9%) epithelial cells, 5 (11.9%) phosphate crystals, 16 (38.1%) pus cell , 9 (21.4%) yeast cells, 7(16.7%) red blood cells and eggs of *Schistoma haematobium* 2(4.8%). Bacteria isolated were: *Escherichia coli* 20 (25.3%), followed by *Staphylococcus aureus* 16 (20.3%), *Pseudomonas aureginosa* 10 (12.7%), Coagulase negative *Staphylococcus* spp 9 (11.4%), *Streptococcus pyogenes* 6 (7.6%), *Serratia marcescens* 6 (7.6%), *Enterobacter* spp 5 (6.3%). *Klebsiella* spp. 4 (5.1%) and *Enterococcus faecalis* 3(3.8%). *E. coli* showed low percentage resistance to ciprofloxacin, ceftazidime and ceftriaxone. *Enterobacter* spp. were susceptible to ciprofloxacin and cotrimoxazole in 80%, respectively. Between 60-80% of *Pseudomonas aeruginosa* and *Enterobacter* spp were susceptible to all the tested antibiotics, while 4(66.7%) *Streptococcus pyogenes,* 6 (66.7%) CON-*Staphylococcus* spp and 4(66.7%) *Serratia marcescens* were sensitive to ceftazidime. All the *Enterococcus faecalis* and *Klebsiella* spp isolated were sensitive to ciprofloxacin. The phenotypic determination identified a low ESβL rate of 28.8 % (13 of 45 isolates). ESBLs were detected among the following species: 5 *Escherichia coli* (25.0%), 3 *Pseudomonas* spp (30.0%), 1 *Klebsiella* spp (25.0%), *Serratia marcescens*2 (33.3%) and *Enterobacter* spp. 2 (40.0%). The result also showed that 18.9 % of the bacteria were resistant to at least 3 antibiotics with (MAR) index ranging from 0.2 to 0.8. The results obtained in this study are statistically significant ($p \leq 0.05$). However, continuous surveillance to monitor the prevalence of UTI and antimicrobial resistance among post menopausal women is overwhelmingly necessary.
[Akinjogunla, O. J., Odeyemi, A. T. and Olasehinde, G. I. **Epidemiological Studies of Urinary Tract Infection (UTI) among Post-menopausal Women in Uyo Metropolis, South-South, Nigeria.** Journal of American Science 2010;6(12):1674-1681]. (ISSN: 1545-1003). http://www.americanscience.org.

Key Words: Post-menopausal, Prevalence, Infection, Susceptibility, ESβL, Uyo

INTRODUCTION

The urinary tract consists of various organs of the body involved in the production, storage and excretion of urine. (Sotelo and Westney, 2003; Beer *et al*., 2006). Urinary tract infection (UTI) is caused by pathogenic invasion of the urinary tract, which leads to an inflammation of the urothelium. The invading microbes may affect the entire tract or be restricted to either the upper region or lower region (Stamm and Norrby, 2001). Urinary tract infection (UTI) is one of the most common causes of hospitalization and referral to outpatient, having an estimated figure of 150 million per annum worldwide. (Stamm and Norrby, 2001; Fakhrossadat and Narges, 2009). The urinary tract infections may be asymptomatic, acute, chronic and complicated or uncomplicated and the clinical manifestations of UTI depend on the portion of the urinary tract involved, the etiologic organisms, the severity of the infection, and the patient's ability to mount an immune response to it. Acute urinary tract infection is an extremely common entity that affects almost half of women in The United states of America (Foxman, 2002). The prevalence and incidence of urinary tract infection is higher in women than in men, which is likely the result of several clinical factors including hormonal effects, behaviour patterns or their having a short urethra and vaginal vestibule which can easily be contaminated (Harding and Ronald, 1994). Prevalence of UTIs increases with advancing age and in females the prevalence ranged from 3% in young girls under the age of 10 to a peak of 10% in post-menopausal women between the ages of 55 and 64 (Young and Koda-Kimble, 1995; Sotelo and Westney, 2003).The leading causes of acute and uncomplicated UTIs in patients have been reported to be due to *Escherichia coli, Staphylococcus aureus, Proteus spp,*

Klebsiella spp and *Pseudomonas aeruginosa* (Manges *et al*., 2006; Akram *et al*., 2007; Akortha and Ibadin, 2008). In Nigeria, *E. coli*, *Proteus spp* and *Klebsiella spp* have been isolated in 90% of UTI reposted cases (Obaseiki-Ebor, 1988; Foxman, 1990). The symptoms of UTIs which include fever, burning sensations while urinating, lower abdominal pain, itching, formation of blisters and ulcers in the genital area, genital and suprapubic pain, and pyuria generally depend on the age of the person infected and the location of the urinary tract infected (Amali *et al*., 2009). UTIs are associated with a high risk of morbidity and mortality and account for significant health care costs in spite of the availability and use of the antimicrobial drugs.

Hormonal changes that characterize menopause are likely to influence the habits of women. A number of observational epidemiological studies have dealt with risk factors of chronic diseases, namely cardiovascular disease (CVD), osteoporosis, and urinary tract infection. In post-menopausal women, susceptibility to UTI increases due to a deficiency of oestrogen (Foxman,1999). Sensitivity of bacterial to antibiotics shows a great geographical and historical variability due to different antibiotic treatments (Akinjogunla *et al*., 2009). So knowledge of the sensitivity pattern of common uropathogens according to local epidemiological studies is necessary for selection of appropriate antibiotics for empirical treatment. Researches have not been extensively carried out to determine the prevalence of symptomatic or asymptomatic bacteriuria among the postmenopausal women in this environment , this therefore necessitated this study that determined the prevalence and sensitivity pattern of uropathogens isolated from post-menopausal women in Uyo Metropolis.

MATERIALS AND METHODS

STUDY SETTING

This cross-sectional study was designed to cover post-menopausal women in Uyo metropolis. Uyo is the capital city of Akwa –Ibom State located in the South-South (S/S) part of Nigeria. Uyo metropolis was selected for the study due to its dense population. Demographic information such as age, and time of stoppage of their menstrual cycle of each post-menopausal woman obtained were kept confidential.

COLLECTION OF MID STREAM URINE SAMPLES

In a prospective study from January to June, 2009, a total of 106 mid-stream urine (MSU) samples from apparently healthy postmenopausal women who gave verbal informed consent were aseptically collected into sterile McCartney bottles and stored at 4^{o}C.

MICROSCOPIC EXAMINATION OF MID STREAM URINE SAMPLES

Two loopful of uniformly mixed uncentrifuged urine samples were aseptically placed on a clean grease-free slide and covered with a cover slip**.** The preparation was examined microscopically to detect the presence of pus cell, epithelial cell, red blood cell, yeast cell, phosphate crystal using 10x and 40 x condenser iris closed sufficiently to give good contrast.

ISOLATION AND IDENTIFICATION OF UROPATHOGENS

The uncentrifuged, uniformly mixed mid stream urine (MSU) samples were inoculated on Cysteine lactose electrolyte deficient (CLED), MacConkey agar (MCA) and Blood agar (BA) media and incubated at 37°C aerobically for 24 hrs. After incubation the cultures developed on media were observed and the colonies were counted by colony counter. Significant urinary tract infection (UTI) was defined as the presence of $\geq 10^5$ colony-forming units per millimeter in the culture of an appropriately collected urine sample. Standard identification procedures of colony morphology, Gram staining reaction, motility, catalase test, oxidase test, urease test, coagulase test, sugar fermentation, indole production and IMViC (Indole, Methyl red, Voges-Proskauer, and Citrate) tests were used to determine the uropathogens present in the urine samples.

THE ANTIBIOTIC SENSITIVITY TESTING

The antibiotic sensitivity of the bacterial species isolated from the mid stream urine samples was performed by disk diffusion method on Muller-Hinton agar plates as described by the National Committee for Clinical Laboratory Standards (presently called as Clinical Laboratory Standard Institute). 0.1 ml of each bacterial isolates was seeded into each of the Petri dishes containing Mueller-Hinton agar and were allowed to stand for 30 mins to enable the inoculated organisms to pre-diffuse. The commercially available discs containing the following antibiotics: Ceftazidime, (Caz,30ug), Streptomycin (Stp,30ug) Ciprofloxacin (Cpf,5ug) Ceftriaxone (Cef,30ug) and Cotrimoxazole (Cot, 30ug) (Oxoid, UK) were aseptically placed on the surfaces of the sensitivity agar plates with a sterile forceps and were incubated for 18 - 24hrs at 37°C. Zones of inhibition after incubation were observed and

the diameters of inhibitory zones were measured in millimeters. The interpretation of the measurement as Sensitive (S) and Resistant (R) was made according to the manufacturer's standard zone size interpretive manual. The percentage resistance was calculated using the formula *PR=a/b×100, where 'PR' was* percentage resistance, '*a*' was the number of resistant isolates and '*b*' was the number of isolates tested with the antibiotic. The percentage sensitivity was calculated using the formula *PS=c/d×100, where 'PS' was* percentage sensitivity, '*c*' was the number of sensitive isolates and '*d*' was the number of isolates tested with the antibiotic.

DETERMINATION OF MULTIPLE ANTIBIOTIC RESISTANCE INDEX (MAR)

Multiple antibiotic resistance index (MAR) was determined using the formula MAR=*x/y*, where *x* was the number of antibiotics to which test isolate displayed resistance and *y* is the total number of antibiotics to which the test organism has been evaluated for sensitivity (Akinjogunla and Enabulele, 2010)

ESBL SCREENING AND DETECTION

All the Gram negative bacteria that are resistant to either ceftazidime or ceftriaxone (≤15) were screened using double-disc synergy tests (DDST) to detect ESBL-producing isolates (Akinjogunla *et al*., 2010). 0.1 ml of each bacterial isolates was seeded into each of the Petri dishes containing Mueller-Hinton agar and were allowed to stand for 30 mins to enable the inoculated organisms to pre-diffuse. An augmentin was placed at the center of the Petri-dish and ceftriaxone (30 µg), ceftazidime (30) at 15mm from the augmentin. An inhibitory zone of 37 mm for ceftriaxone and 22 mm for ceftazidime indicated that the isolated strains are probably ESBL producers.

STATISTICAL ANALYSIS OF RESULTS

Frequencies and percentages were calculated for study variables. Chi-square ($\chi 2$) test was used to calculate probabilities and determine significance. A p-value of less than or equal to 0.05 was considered to be statistically significant ($p \leq 0.05$), while p-value more than 0.05 was considered to be statistically not significant (NS).

RESULTS:

The result obtained showed 42 (39.6%) out of 106 postmenopausal women included in the study had urinary tract infections and the prevalence was highest among post-menopausal women aged 56-60 and lowest among those aged ≥ 61 (Table 1) . Microscopic examinations of forty-two (42) mid-stream urine samples of post menopausal women with urinary tract infections revealed the presence of epithelial cell 13 (30.9%), phosphate crystals 5 (11.9%), pus cell 16 (38.1%), yeast cells 9 (21.4%), eggs of *Schistoma haematobium* 2(4.8%) and red blood cells 7(16.7%) (Table2).

Out of the 42 midstream urine samples of the post menopausal women with UTI, 79 bacterial isolates consisting both Gram positive and Gram negative bacteria were recovered using their morphological and biochemical characteristics such Gram's reaction, motility, catalase, oxidase, coagulase, indole, urease, indole, sugar and IMViC (Indole, Methyl red, Voges-Proskauer, and Citrate) tests (Tables 3 and 4). Of these, *Escherichia coli*. had the highest prevalence of 20 (25.3%), followed by *Staphylococcus aureus* 16 (20.3%), *Pseudomonas aureginosa* 10 (12.7%), Coagulase negative *Staphylococcus* spp 9 (11.4%), *Streptococcus pyogenes* 6 (7.6%), *Serratia marcescens* 6 (7.6%), *Enterobacter* spp 5 (6.3%). *Klebsiella* spp. 4 (5.1%), *Enterococcus faecalis* 3 (3.8%), (Table 4). The incidence of sensitivity of uro-pathogens isolated to five antibiotics routinely used to treat UTI infections are shown in (Table 5). *E. coli* as the predominant cause of UTI, showed low percentage resistance to ciprofloxacin in 25.0% , ceftazidime in 25.0% and the lowest resistance to ceftriaxone in 20.0%. *Enterobacter* spp. displayed a similar resistance pattern and were susceptible to ciprofloxacin and cotrimoxazole in 80%, respectively. Between 60-80% of *Pseudomonas aeruginosa* and *Enterobacter* spp. were susceptible to ceftazidime, streptomycin, ciprofloxacin, ceftriaxone and cotrimoxazole, while 4(66.7%) *Streptococcus pyogenes*, 6 (66.7%) CON-*Staphylococcus* spp and 4(66.7%) *Serratia marcescens* were sensitive to ceftazidime. All the *Enterococcus faecalis* and *Klebsiella* spp. isolated from post-menopausal women with UTI were sensitive to ciprofloxacin (Table 5). 13 (28.9%) out of 45 Gram negative bacterial species produced extended spectrum betalactamase with *Escherichia coli* producing the highest, followed by *Pseudomonas aeruginosa* 3 (30.0%), while *Klebsiella* spp, *Serratia marcescens and Enterobacter* spp had 1 (25.0%)., 2 (33.3%), 2 (40.0%), respectively.(Table 6). The result also showed that 15 (18.9 %) of the bacteria were resistant to 3 or more antibiotics with MAR index ranging from 0.2 to 0.8 in *Escherichia coli, Staphylococcus aureus* and CON-*Staphylococcus* spp., respectively. *Pseudomonas aureginosa and Enterococcus faecalis* had MAR index ranging from 0.2 to 0.6, while lowest MAR index of 0.2-0.4 was obtained in *Klebsiella* spp. and *Enterobacter* spp (Table 7).

Table 1: Age Groups and Occurrence of UTI among Post –menopausal women

Age / Yrs	No of Samples Collected	No / Percentages (%) Positive for UTI
≤ 50	30	11 (36.7)
51-55	20	8 (40.0)
56-60	35	17(48.6)
≥ 61	21	6 (28.6)
Total	106	42 (39.6)

Table 2: Microscopic Examination of Mid-stream 42 Urine Samples of Post-menopausal Women with Urinary Tract Infection

Microscopic Examination	Number of Occurrence	Percentage of Occurrence (%)
Epithelial cell	13	30.9
Phosphate crystals	5	11.9
Pus cell	16	38.1
Yeast cells	9	21.4
Eggs of *Schistoma haematobium*	2	4.8
Red blood cells	7	16.7

Table 3: Morphological and Biochemical Characteristics of Bacteria Isolated from 42 Mid-stream Urine Samples of Post- menopausal women with Urinary Tract Infection

	Isolates								
PARAMETERS	a	b	c	d	e	f	g	h	i
Grams reaction	+/cocci	+/cocci	+/cocci	-/rod	-/rod	+/cocci	-/ rod	-/rod	-/ rod
Catalase test	-	+	+	-	-	-	-	-	-
Citrate test	-	-	-	-	-	-	+	+	-
Oxidase test	-	-	-	-	-	-	-	-	+
Coagulase test	-	+	-	-	-	-	-	-	-
Indole test	-	-	-	+	-	-	-	-	-
Urease activity	-	-	-	-	-	-	-	+	-
Glucose	+	+	+	+	+	+	+	+	+
Lactose	-	-	-	+	+	-	-	+	-
Sucrose	-	-	-	-	-	-	+	+	-
Mannitol	+	+	+	+	+	+	+	+	+
Motility	+	+	+	+	+	+	+	-	+
Voges Proskauer	-	+	+	-	+	-	+	+	-

Keys a: *Streptococcus* spp.; b: *Staphylococcus aureus*; c: *CON-Staphylococcus* spp.; d: *Escherichia coli*; e: *Enterobacter* spp.; f: *Enterococcus faecalis*; g*: Serratia marcescens*; h: *Klebsiella* spp i*: Pseudomonas aeruginosa*;

Table 4: Occurrence of Bacteria Associated with 42 Mid Stream Urine Samples of Post-menopausal Women with Urinary Tract Infection

Bacterial spp	Age Groups ≤ 50	51-55	56-60	≥ 61	Total Number / Percentage of Occurrence
Escherichia coli.	8	3	7	2	20 (25.3)
Klebsiella spp.	2	0	2	0	4 (5.1)
Staphylococcus aureus	6	3	6	1	16 (20.3)
Streptococcus pyogenes	2	2	2	0	6 (7.6)
Pseudomonas aeruginosa	2	2	4	2	10 (12.7)
CON-*Staphylococcus* spp	1	3	3	2	9 (11.4)
Serratia marcescens	0	1	2	3	6 (7.6)
Enterobacter spp	1	1	2	1	5(6.3)
Enterococcus faecalis	0	1	1	1	3(3.8)
Total	22	16	29	12	79 (100)

Table 5: Antibiotic Susceptibility Profile of Bacteria Isolated from 42 Mid-stream Urine Samples of Post-menopausal Women with Urinary Tract Infection

Bacterial Isolated	Caz^s n (%)	Caz^r n (%)	Stp^s n (%)	Stp^r n (%)	Cpf^s n (%)	Cpf^r n (%)	Cef^s n(%)	Cef^r n(%)	Cot^s n(%)	Cot^r n(%)
Escherichia coli. (20)	15(75.0)	5(25.0)	13(65.0)	7(35.0)	15(75.0)	5(25.0)	16 (80.0)	4(20.0)	11(55.0)	9(45.0)
Klebsiella spp. (4)	3(75.0)	1(25.0)	1(25.0)	3(75.0)	4(100.0)	0(0.0)	4(100.0)	0(0.0)	2(50.0)	2(50.0)
Staphylococcus aureus (16)	7(43.8)	9(56.3)	9(56.3)	7(43.8)	12(75.0)	4(25.0)	10(62.5)	6(37.5)	9(56.3)	7(43.8)
Streptococcus pyogenes (6)	4(66.7)	2(33.3)	2(33.3)	4(66.7)	2(33.3)	4(66.7)	3(50.0)	3(50.0)	2(33.3)	4(66.7)
Pseudomonas aeruginosa (10)	7(70.0)	3(30.0)	6(60.0)	4(40.0)	7(70.0)	3(30.0)	8(80.0)	2(20.0)	6(60.0)	4(40.0)
CON-*Staphylococcus* spp (9)	6 (66.7)	3(33.3)	5(55.6)	4(44.4)	7 (77.8)	2(22.2)	5(55.6)	4(44.4)	6(66.7)	3(33.3)
Serratia marcescens (6)	4(66.7)	2(33.3)	3 (50.0)	3(50.0)	3(50.0)	3(50.0)	4(66.7)	2(33.3)	2(33.3)	4(66.7)
Enterobacter spp (5)	3(60.0)	2(40.0)	4(80.0)	1(20.0)	4(80.0)	1(20.0)	3(60.0)	2(40.0)	4(80.0)	1(20.0)
Enterococcus faecalis (3)	2(66.7)	1(33.3)	1(33.3)	2(66.7)	3(100.0)	0(0.0)	2(66.7)	1(33.3)	1(33.3)	2(66.7)

Keys : Caz : Ceftazidime ; Stp : Streptomycin ; Cpf : Ciprofloxacin ; Cef : Ceftriaxone ; Cot : Cotrimoxazole
s : sensitive ; r : resistant

Table 6: Prevalence of Extended Spectrum Betalactamase among Gram Negative Bacteria Isolated from 42 Mid-stream Urine of Post-menopausal Women with Urinary Tract Infections

Bacterial spp.	Number Isolated	Occurrence (%) of ESβL	Occurrence (%) of non-ESβL
Escherichia coli	20	5(25.0)	15(75.0)
Pseudomonas aeruginosa	10	3(30.0)	7(70.0)
Klebsiella spp.	4	1(25.0)	3(75.0)
Serratia marcescens	6	2 (33.3)	4(66.7)
Enterobacter spp.	5	2 (40.0)	3(60.0)
Total	45	13 (28.9)	32(71.1)

Table 7: Multiple Antibiotic Resistance Index of Bacteria Isolated from 42 Mid-stream Urine Samples of Post-menopausal Women with Urinary Tract Infection

	Multiple Antibiotic Resistance (MAR) Index				
Bacterial Isolated	0.2	0.4	0.6	0.8	Total
Escherichia coli.	14	4	1	1	20
Klebsiella spp.	2	2	-	-	4
Staphylococcus aureus	6	7	2	1	16
Streptococcus pyogenes	-	2	3	1	6
Pseudomonas aureginosa	5	4	1	-	10
CON-*Staphylococcus* spp.	4	4	-	1	9
Serratia marcescens	1	2	3	-	6
Enterobacter spp.	3	2	-	-	5
Enterococcus faecalis	1	1	1	-	3
Total	36	28	11	4	79

DISCUSSION

Mid stream urine samples are among the most numerous of specimens sent for microbiological analysis in order to reduce the morbidity and mortality caused by UTI. Very few data exist concerning UTIs in developing countries, especially among the post-menopausal women in Africa. Microscopic examinations of mid-stream urine samples of post menopausal women with urinary tract infections revealed the presence of epithelial cell, phosphate crystals, pus cell, yeast cells, eggs of *Schistoma haematobium* and red blood cells. The presence of pus cell in mid-stream urine has been recorded by Merila et al. (1987). Occurrence of *Escherichia coli, Serratia marcescens, Enterobacter* spp, *Enterococcus faecalis, Klebsiella* spp. *Pseudomonas aeruginosa,* CON-*Staphylococcus* spp, *Streptococcus pyogenes* and *Staphylococcus aureus* in mid-stream urine samples in this study is similar to the previous reports by Ahmed et al (2000) . *E. coli* was isolated from highest number of cases, followed by *Staphylococcus aureus,* this results is similar with the previous studies by Brosnema *et al.*, (1993); Weber *et al.*, (1997) ; De-Mouy et al (1999); Ahmed et al (2000); Gupta et al (2001); Hryniewicz et al (2001); Hima-Lerible et al (2003). The frequency of occurrence of *Klebsiella* spp obtained from the mid-stream urine samples in this study is lower than the values obtained by Randrianirina et al. (2007).

There was occurrence of UTIs among post meno-pausal women with age less than or equal to 50 to age greater than or equal to 60. The occurrence of UTI among women above 60 years have also been recorded by Randrianirina et al (2007). The age distribution of UTIs among post meno-pausal women showed that the highest carrier rate was in the age group of 56-60 years (48.6%), and lowest among aged ≥ 61years .This result suggest that UTI is not an age moderated disease or infection.

The prevalent pathogens of UTIs have been found to be resistant to most chemotherapeutic agents, though the antimicrobial susceptibilities of these pathogens are highly predictable. Development of resistance to these antimicrobial agents in UTI cases will therefore affect future treatment and management of the infection with these drugs. Majority of the treatments begins or is done completely empirically, the knowledge of the organisms their epidemiological characteristics and their antibacterial susceptibility is therefore mandatory.

The isolated bacteria were resistant to streptomycin. This observed resistance to these drugs is a probable indication of earlier exposure of the isolates to these drugs. Shittu and Mandare (1999) in slight contrast to this study, reported *S. aureus* as 100% sensitive to cephalosporins**.** The high sensitivity of *Staphylococcus aureus, E. coli* and *Pseudomonas aeruginosa* to ciprofloxacin in this study is similar to the valued obtained by Ehinmidu (2003). The resistant of *Staphylococcus aureus* and *E. coli* to streptomycin in this study is in agreement with the result obtained by Ehinmidu (2003). Randrianirina et al (2007) reported the resistance to of uro-pathogens to third-generation cephalosporins and ciprofloxacin and this is in conformity with this study.

Multiple-antibiotic resistant bacteria are important pathogens and commonly express ESBL enzymes belonging to the SHV family; encoded by blaSHV genes (Jones et al., 2005). Many reports from different countries and regions have showed different prevalence rates of ESBLs producing *Enterobacteriaceae* causing urinary tract infections**.** The occurrence of ESBL-producing *Klebsiella* spp and *E. coli* in this study is similar to the results of Jones et al. (2005) and Ktari et al. (2006). Genes encoding

ESBL such as blaTEM, blaSHV, and blaCTX-M are usually located on conjugative plasmid. The increasingly prevalent of Extended-spectrum B-lactamases producing *E. coli* bacteria have been also reported (Naas et al., 2007; Akinjogunla et al., 2010). The prevalence of ESβL-producing isolates among the post menopausal women may be presumably due to overuse of some antibiotics resulting in selective pressure on new types of betalactamase antibiotics most especially cephalosporins. The production of extended spectrum β- lactamase (ESBL) among *E. coli* and *K. pneumoniae* also contributed significantly to the resistance of these isolates (Jenks *et al*., 1995). Multiple antibiotics resistance (MAR) index is a tool that reveals the spread of bacteria resistance in a given population (Krumpermann, 1983). An MAR index greater than 0.2 implies that the strains of such bacteria originate from an environment where several antibiotics are used. The MAR indices obtained in this study is similar to the valued obtained by Ehinmidu (2003), and this shows that a very large proportion of the bacteria isolates have been exposed to several antibiotics. Moreover these differences in sensitivity profile of the bacteria isolated may be attributed to practices of self medication, the drug abuse and indiscriminate misuse of antibiotics among the post-menopausal women, which has favoured the emergence of resistance strains.

In conclusion, therapy against UTIs should be guided by antimicrobial susceptibilities as increasing numbers of urinary isolates are developing resistance to commonly use antibiotics. Increasing antimicrobial resistance of uropathogens has led to reconsideration of traditional treatment of recommendations in many areas. This retrospective study should be followed by a multicentre study on antimicrobial resistance among post-menopausal women in Uyo and other regions as there is no data concerning the antibiotic susceptibility spectrum of bacteria isolated from Post-menopausal women with UTIs in South-South part of Nigeria have been published to date.

Corresponding Author
E–mail: papajyde2000@yahoo.com
Tel No: +2348064069404

REFERENCES

1. Ahmed, A.A., Osman, H. and Mansour, A.M. 2000. Antimicrobial agent resistance in bacterial isolates from patients with diarrhea and urinary tract infection in Sudan. American Journal of Tropical Medicines and Hygiene. 63: 259–263.
2. Akinjogunla, O J., Eghafona, N. O. and Ekoi, O. H. 2009. Diarrheagenic *Escherichia coli* (DEC): Prevalence among in and ambulatory patients and susceptibility to antimicrobial chemotherapeutic agents. Journal of Bacteriology Research, 1 (3).34–38
3. Akinjogunla, O. J., Eghafona, N. O., Enabulele, I. O., Mboto, C. I. and Ogbemudia, F. O. 2010. Antibacterial activity of ethanolic extracts *of Phyllanthus amarus* against extended spectrum β-lactamase producing *Escherichia coli* isolated from stool samples of HIV sero- positive patients with or without diarrhoea African Journal of Pharmacy and Pharmacology 4(6):402-407.
4. Akinjogunla, O. J. and Enabulele, I. O. 2010. Virulence Factors, Plasmid Profiling and Curing analysis of Multi-drug Resistant *Staphylococcus aureus* and Coagulase negative *Staphylococcus* spp. isolated from Patients with Acute Otitis Media : Journal of American Science 6(11):1022-1033
5. Akortha, E.E. and Ibadin, O.K. 2008. Incidence and antibiotic susceptibility pattern of *Staphylococcus aureus* amongst patients with urinary tract infection (UTI) in UBTH Benin City, Nigeria. African Journal Biotechnolo gy. 7(11):1637-1640.
6. Akram, M., Shahid, M. and khan, A. 2007. Etiology and antibiotic resistance pattern of community acquired urinary tract infection in JNMC Hospital India. Annals of Clinical Microbiology and Antimicrobial. 6(4):1-7.
7. Amali, O., Indinyero, M.D., Umeh, E.U. and Awodi, N.O. 2009. Urinary Tract Infections among Female Students of The University Of Agriculture, Makurdi, Benue State, Nigeria. The Internet Journal of Microbiology. 7 (1):1-5.
8. Beers, M.H., Porter, R.S., Jones, T.V., Kaplan, J.L. and Berkwits, M. 2006. The Merck Manual of Diagnosis and Therapy. 18th edition. New Jersey: Merck Research Laboratories; pp1-85
9. Brosnema, D.A., Adams, J.R., Pallares, R. and Wenzel, R.P. 1993. Secular trends in rates and etiology of nosocomial urinary tract infections at a university hospital. Journal of Urology. 150:414-416.
10. De-Mouy. D., Cavallo, J.D, Armengaud, M. 1999. Infections urinaires en pratique de ville: e´tiologies et sensibilite´ aux antibiotiques en function des ante´ce´dents. Presse Med; 28: 1624–28.
11. Ehinmidu, J. O. 2003. Antibiotics susceptibility patterns of urine bacterial isolates in

Zaria, Nigeria. Tropical Journal of Pharmaceutical Research, 2 (2): 223-228.
12. Fakhrossadat, M. and Narges, S. 2009. Changing patterns in sensitivity of bacterial uropathogens to antibiotics in children. Pakistan Journal of Medical Sciences 25(5):801-805.
13. Foxman, B. 1990. Recurring urinary tract infection: Incidence and risk factors. American Journal of Public Health, 80, 331-333.
14. Foxman, B. 1999. Urinary tract infection in postmenopausal women. Current Infectious diseases Reports. 1(40):367-370
15. Foxman, B. 2002. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. Diseases. 49(2):53-70.
16. Gupta, K., Sahm, D.F. and Mayfield, D. 2001. Antimicrobial resistance among uropathogens that cause community-acquired urinary tract infections in women: a nationwide analysis. Clinical Infectious Diseases. 33: 89–94.
17. Harding, G. and Ronald, R 1994. The management of urinary infections: what have we learned in the past decade? International Journal of Antimicrobial Agents 4: 83–88.
18. Hima-Lerible, H., Me´nard, D. and Talarmin, A. 2003. Antimicrobial resistance among uropathogens that cause community-acquired urinary tract infections in Bangui, Central African Republic. Journal of Antimicrobial Chemotherapy. 51: 192–194.
19. Hryniewicz, K., Szczypa, K. and Sulikowska, A. 2001. Antibiotic susceptibility of bacterial strains isolated from urinary tract infections in Poland. Journal of Antimicrobial Chemotherapy. 47:773–80.
20. Jenks, P.J., Hu, Y.M., Danel, F., Mehtar, S. and Livermore, D.M. 1995. Plasmid mediated
21. production of class I (AmpC) β-lactamase by two *Klebsiella pneumoniae*. Journal of Antimicrobial Chemotherapy. 35: 235-236.
22. Jones, L.A., McIver, C.J., Kim, M.J., Rawlinson, W.D. and White, P. 2005. The *aad*B gene cassette is associated with blaSHV genes in *Klebsiella* species producing extended-spectrum ß- lactamases. Antimicrobial Agents and Chemotherapy. 49(2): 794-797.
23. Krumpermann, P.H. 1983. Multiple Antibiotics Resistance Indexing of *E. coli t*o identify high risks sources of faecal contamination of foods. Applied Environmental Microbiology 46:165-170.
24. Ktari, S., Arlet, G., Mnif, B., Gautier, V., Mahjoubi, F., Jmeaa, M.B., Bouaziz, M. and Hammami, A.2006. Emergence of multi-drug resistant *Klebsiella pneumoniae* isolates producing VIM- 4 metallo-ß-lactamase, CTX-M-15 extended-spectrum ß-lactamase, and CMY-4 AmpC ß- lactamase in a Tunisian university hospital. Antimicrobial Agents and Chemotherapy. 50(12): 4198-4201.
25. Manges, A.R., Natarajan, P., Solberg, O.D., Dietrich, P.S. and Riley, L.W. 2006. The changing prevalence of drug-resistant Enterobacteriaceae groups in a community: evidence for community outbreaks of urinary tract infections. Epidemiology and Infections. 134: 425– 431.
26. Merila, S., Raisanen, M., Ylitalo, P. and Eskelinen, K. 1987.Microscopic examination of bacteria and cells in urine: International Urology and Nephrology 19(2): 109-113.
27. Naas, T., Oxacelay, C. and Nordmann, P. 2007. Identification of CTX-M-type extended-spectrum- ß-lactamase genes using real-time PCR and pyrosequencing. Antimicrobial Agents and Chemotherapy. 51(1): 223-230.
28. Obaseike-Ebor, E. E. 1988. Trimethoprim / Sulphamethoxazole resistance in *Escherichia coli* and *Klebsiella* spp. urinary isolates. African Journal of Medical Science. 17: 133-140.
29. Randrianirina, F., Jean-Louis, S., Jean-Francois, C., Elisoa, R., Pierre G and Antoine T. 2007. Antimicrobial resistance among uropathogens that cause community-acquired urinary tract infections in Antananarivo, Madagascar. Journal of Antimicrobial Chemotherapy.59, 309–312
30. Shittu, S.O. and Mandere, M.U. 1999. Asymptomatic bacteriuria in antenatal patients in A.U.TH Zaria. Tropical Journal of Obstetrics and Gynecology. 16(1): 41.
31. Sotelo, T. and Westney, O.L. 2003. Recurrent urinary tract infections in women. Curr Womens Health Rep.3; 313-318.
32. Stamm, W. E. and Norrby, S. R .2001. Urinary tract infections: disease panorama and challenges Journal of Infectious Diseases. 183(1): S1-4.
33. Weber, G., Riesenberg, K., Schlaeffer, F., Peled, N., Borer, A. and Yagupsky, P. 1997. Changing trends in frequency and antimicrobial resistance of urinary pathogens in outpatient clinics and a hospital in Southern Israel, 1991-1995. European Journal of Clinical Microbiology and Infectious Diseases. 16: 834- 838.
34. Young, L.Y. and Koda-Kimble, M. 1995. Applied therapeutics: The clinical use of drugs. 6th edition. pp 1-74