

# Urinary tract infection in a rural community of Nigeria

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## Abstract

**Aim:** To determine the prevalence of urinary tract infection (UTI) in Okada, a rural community in Nigeria, and the effect of age and gender on its prevalence as well as the etiologic agents and the susceptibility profile of the bacterial agents. **Patients and Method:** Clean-catch midstream urine was collected from 514 patients (49 males and 465 females). The urine samples were processed and microbial isolates identified. Susceptibility testing was performed on all bacterial isolates. **Result:** The prevalence of urinary tract infection was significantly higher in females compared to males (female vs. male: 42.80% vs. 10.20%; OR = 6.583, 95% CI = 2.563, 16.909; P < 0.0001). Age had no effect on the prevalence of UTI. *Escherichia coli* was the most prevalent isolate generally and in females, while *Staphylococcus aureus* was the predominant isolate causing urinary tract infection in males. The fluoroquinolones were the most active antibacterial agents. **Conclusion:** An overall prevalence of 39.69% was observed in this study. Females had a 3 to 17 fold increase risk of acquiring UTI, than their male counterpart. *Escherichia coli* were the predominant isolates causing UTI.

**Keywords:** Urinary tract infection, rural community, prevalence, bacterial, *Escherichia coli*, *Staphylococcus aureus*.

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## Introduction

Urinary tract infections are among the most common bacterial infections in humans both in the community and hospital settings, and they occur in all age groups, and usually required urgent treatment [1]. Urinary tract infection remains a leading cause of healthcare expenditure for people of all age groups, with an overall annual cost of 1.6 billion dollars in the United States of America [2].

Malnutrition, poor hygiene, low socio-economic status are associated with urinary tract infections and these factors are rife in rural settings [3]. Although *Escherichia coli* has been reported as the predominant isolate causing urinary tract infection, few authors have reported changing patterns in the prevalence of uropathogens [4, 5]. Urinary pathogens especially from community patients have been known to include strains that are resistant to many of the commonly used antibiotics [6]. Therefore there is need for

periodic monitoring of etiologic agents of urinary tract infection, and their susceptibility pattern especially in a rural setting. Against this background, as well as the paucity of reports of urinary tract infections in our rural community (Okada), this study was undertaken.

The aim of this study is to determine the prevalence of urinary tract infection in Okada community as well as the effect of gender and age on its prevalence. The etiologic agents and their susceptibility pattern will also be determined.

## Patients and Methods

### Study area

Okada, a rural community, is the headquarters of Ovia North East Local Government Area of Edo-state. The Local Government has an estimated population of 155 344 persons [7]. Majority of the residents of Okada are farmers with few Civil Servants, Lecturers and Students making

less than 5% of the community. The study was carried out at Igbinedion University Teaching Hospital, Okada from January 2007 to December 2009. Some neighbouring rural communities (villages) also attend the Hospital.

#### Study population

A total of five hundred and fourteen patients with signs and symptoms of urinary tract infection were recruited for this study. They consisted of 465 females, and 49 males, with age ranging from 12 to 76 years. Exclusion criteria included antibiotic usage within week and large fluid intake (less than one hour) before clinic attendance. Verbal informed consent was obtained from all patients or their parents in case of children prior to specimen collection. The Ethical Committee of Igbinedion University Teaching Hospital, Okada approved the protocol for this study.

#### Specimen collection and processing

Clean-catch midstream urine was collected from each patient into sterile screw-capped universal container, containing, few crystals of boric acid as preservative. The specimen was mixed, labeled and transported to the laboratory for processing.

A loopful (0.001mL) of well mixed un-centrifuged urine was streaked on to the surface of blood agar and cysteine lactose electrolyte deficient (CLED) medium. (M6: Plasmatec Laboratories, United Kingdom). The plates were incubated aerobically at 37°C for 24hrs and counts were expressed as colony forming units (cfu) per milliliter (mL). A count of  $\geq 10^5$  cfu/ml was considered significant to indicate UTI

Ten ml of each well-mixed urine sample was centrifuged at 2000g for 5 minutes. The supernatant was discarded and a drop of the deposit was examined microscopically at high magnification for pus cells red blood cells, epithelial cells, cast, crystal, yeast-like cells and *Trichomonas vaginalis*. Pus cells  $\geq 5$  per high power field were considered significant to indicate infection. Urinary tract infection was diagnosed, if the bacteria or pus cell count, or both were significant in an individual. The isolates were identified by standard microbiological method [8], and disc susceptibility test for bacterial isolates was performed by BSAC method [9].

#### Statistical analysis

The data were analyzed using Chi square ( $X^2$ ) test and odd ratio analysis, using the statistical software INSTAT<sup>(R)</sup>.

## Results

A total of 204 (39.69%) out of 514 patients had urinary tract infection. Female gender was a significant risk factor for acquiring UTI (female vs. male: 42.8% vs. 10.2%, OR = 6.583, 95% CI = 2.563, 16.909%,  $P < 0.0001$ , Table 1). The prevalence of UTI was highest within the 21 – 30years age group (44.67%), and was least within the age range of 51 – 60 years (24.32%), although age did not significantly affect the prevalence of UTI ( $P=0.253$ ).

*Escherichia coli* were the most predominant isolate causing UTI, as well as in females (Table 2). This is followed by *Staphylococcus aureus*, *Candida albican*, and *Pseudomonas aeruginosa* was the least with a prevalence of 2.45%. *Staphylococcus aureus* was the most predominant isolate causing UTI in male. *Klebsiella* species, *Pseudomonas aeruginosa*, and *Candida albicans* were not recovered from male patients. The susceptibility profile of the bacterial isolates showed that ciprofloxacin was the most active antibacterial agent, while nalidixic acid, nitrofurantoin, sulphamethoxazole-trimetoprim, amoxicillin and amoxicillin-clavulanate and were poorly active against the bacterial isolates (Table 3).

**Table 1** Effect of gender and age on prevalence of urinary tract infection

	No. tested	No. infected(%)	OR	95% CI	P Value
Male	49	5(10.20)	0.152	0.059,0.390	
Female	465	199(42.80)	6.583	2.563,16.909	<0.0001
Age(years)					
11 – 20	143	52 (36.36)			
21 – 30	197	88 (44.67)			
31 – 40	89	37 (41.57)			
41 – 50	37	14 (37.84)			
51 – 60	37	9 (24.32)			
$\geq 61$	11	4 (36.36)			0.235

OR = odd ratio; CI = confidence interval

**Table 2** Prevalence of uropathogens

Organisms	Male(%)	Female (%)	Total (%)
<i>Escherichia coli</i>	1 (20)	84 (42.21)	85 (41.16)
<i>Klebsiella</i> species	0	9 (4.52)	9(4.41)
<i>Proteus</i> Species	1 (20)	13 (6.53)	14 96.68)
<i>Pseudomonas aeruginosa</i>	0	5 (2.51)	5 (2.45)
<i>Staphylococcus aureus</i>	3 (60)	63 (31.16)	66 (32.35)
<i>Candida albicans</i>	0	25 (12.56)	25 (12.25)
<b>Total</b>	5 (2.45)	199 (97.55)	204

## Discussion

Against the background of paucity of reports of urinary tract infection in our rural setting, this study aimed at determining the prevalence of UTI, in a rural community (Okada), the effect of gender and age on its prevalence, as well as the etiologic agents and their susceptibility profile.

A total of 204 (39.69%) out of the 514 patients had UTI. This is lower than the 49% obtained by Orrett [6]. Geographical location may be the reason for the difference. The finding that females had higher prevalence of UTI than males agrees with earlier studies [5, 10, 11]. Close proximity of the female urethral meatus to the anus, shorter urethra, and sexual intercourse have been reported as factors that influences this higher prevalence in women [4].

The age range of 21 – 30 years had the highest prevalence of UTI (44.67%). This is in agreement with the findings of Orrett [6]. However the prevalence of UTI did not differ significantly within age groups in this study.

**Table 3** Susceptibility profiles of urinary bacterial isolates

Organisms	Antibacterial agents µg/DISC								
	CIP (5)	PEF (5)	OFL (5)	GEN (10)	NA (30)	NIT (300)	AMX (30)	SXT (25)	AU (50)
<i>E. coli</i> (85)	77(905)	60(705)	60(705)	45(52.9)	9 (10.5)	16(18.8)	11(12.9)	21(24.7)	11(12.9)
<i>Klebsiella spp</i> (9)	8(88.8)	9(100)	9(100)	7(77.7)	1(11.1)	4(44.4)	2(22.2)	4(44.4)	3(33.3)
<i>Proteus spp.</i> (14)	9(64.2)	7(50.0)	5(35.7)	6(42.8)	1(7.1)	3(21.4)	3(21.4)	3(21.4)	5(35.7)
<i>P. aeruginosa</i> (5)	3(60)	1(20)	2(40)	0	0	0	0	0	0
<i>S. aureus</i> (66)	48(72.7)	43(65.7)	36(54.5)	31(46.9)	-	5(7.5)	1(1.5)	3(4.5)	6(9.1)

CIP: Ciprofloxacin, PEF: Pefloxacin, OFL: Ofloxacin, GEN: Gentimycin, NA: Nalidixia acid, NIT: Nitrofurantoin, AMX: Amoxicillin, SXT: Sulphamethoxazole–trimetoprim, AU: Amoxicillin–clavulanate.

*Escherichia coli* were the predominant isolate causing UTI in this study. This agrees with previous reports [6, 11, 12]. However two recent studies in Benin City (urban settlement), Nigeria indicate *Staphylococcus aureus* as the predominant isolate [4, 5]. These studies were on asymptomatic subjects as compared to this current study which was on persons with symptoms of UTI. It is possible that the agents of symptomatic and asymptomatic UTI differ. However, this will require further investigations to verify.

The reason for the high prevalence of *Staphylococcus aureus* in males is not clear, though lack of circumcision receptive anal intercourse and HIV infection are recognized risk factors for UTI in males [1]. The susceptibility profile indicates that the flouroquinolones were the most active antibacterial agents followed by the aminoglycosides. This result is in agreement with recommendations of Stamm and Hooton [13]. Nalidixic acid, nitrofurantoin, sulphamethoxazole–trimetoprim, amoxicillin and amoxicillin–clavulanate showed very poor activity. This may be due to long term use of these drugs over the years. Also, prescription of antibiotics without laboratory guidance as well as over the counter sales of antibiotics without prescription are rife in the Nigerian setting [5, 14].

Conclusively, an overall prevalence of 39.69% of UTI was observed in this study. Females had a 3 – 17 fold increase risk of having UTI, and *Escherichia coli* was the predominant isolate causing UTI. Although the flouroquinolones were the most active antibacterial agents, prudent use of antibiotics is advocated.

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