



**RESEARCH ARTICLE**

**A Comparative Prevalence of *Escherichia coli* and *Staphylococcus aureus* Antibiotic Susceptibility Profiles in Urinary Infection**

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**ABSTRACT**

A comparative study was carried out on the prevalence and antibiotic sensitivity of *Escherichia coli* and *Staphylococcus aureus* isolates from 100 mid-stream urine samples of Urinary Tract Infection (UTI) patients. *Escherichia coli* gave isolation rates of 66.7% in female and 62.5% in male against *Staphylococcus aureus* 28.7% male and 37% female respectively. The antibiotic susceptibility test carried out on the isolates gave a results that reflect the current knowledge on their reactions to commonly prescribed antibiotics while the higher prevalence of *Escherichia coli* confirms its frequent occurrence in UTI, the detection of *Staphylococcus aureus* and *Escherichia coli* relatively considerable resistance to oxacillin in the this study indicated the inherent ability of the organisms to adapt.

**KEYWORDS**

Antibiotic sensitivity *Escherichia coli*, *Staphylococcus aureus*

**INTRODUCTION**

Urinary tract infection (UTI) is defined as significant bacteriuria in the presence of a constellation of symptoms such as dysuria (painful urination), increased urinary frequency and urgency, suprapubic discomfort and cost vertebral angle tenderness.

It is a common cause of infections, particularly among young, sexually active women; an estimated 1 in 3 women will develop an urinary tract infection before the age of 24 years (Barret, 1999). Infection may involve either only the lower urinary tract or both the upper and lower tracts. The process of infection involves spontaneous ascent of bacteria from the urethra to the bladder, kidney and blood stream.

This can be influenced by some factors such as accidental contamination of the urinary tract,

sexual intercourse, immuno-compromised health status, anatomical opening to the urinary tract of the females and physiological changes associated with menstruation and catheterization. UTIs could be community or hospital acquired, involving such microorganisms as *Escherichia coli*, *Staphylococcus spp.*, *Streptococcus spp.*, *Proteus spp.*, *Pseudomonas aeruginosa*, and *Corynebacterium urealyticus* (Alebiosu et.al., 2003).

The strains of *Staphylococcus aureus* commonly associated with UTIs are known to be pathogenic to man on account of harbouring the coagulase enzyme. *Staphylococcus aureus* is a relatively uncommon cause of urinary tract infection in the general population. Although isolation of *Staphylococcus aureus* from urine samples is often secondary to staphylococcal bacteremia arising elsewhere (e.g., in cases of endocarditis), in certain patients, *Staph. aureus* causes ascending urinary tract colonization and

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infection. The majority of cases of *Staph. aureus* bacteriuria are not associated with symptoms of urinary tract infection. Bacteriuria frequently occur concomitantly with long-term urinary catheterization

Urinary tract infections (UTIs) are among the most common infections in humans. *Escherichia coli* strains in particular are responsible for 80% of the UTI cases seen in outpatient clinics. These strains are found in the normal flora of the intestinal tract, skin, and vagina. However, under individual predisposing conditions they can multiply rapidly and are capable of adhering to uroepithelial cells, producing infection (Okunye *et.al.*, 2013).

Age and sex can also have profound effect on the urethra distribution, the diversities of communities and the numbers of the organism are quantitatively greater in older age group and the probability of transmitting urethra microbes by the UTI patients during sexual intercourse is possible, this is more common in the sexually active age group (Michael Wilson, 2005).

The choice of antibiotics in the management of UTI is important, some antibiotics can reduce the presence of urethra microbiota and multiply the chances of urinary tract infections.

The aim of this study was to compare the prevalence of *Escherichia coli* and *Staphylococcus aureus* obtained from urinary tract infections with respect to their susceptibility to conventional antibiotics.

## **MATERIAL AND METHODS**

### **Study area**

This study was carried out in Olabisi Onabanjo University Teaching Hospital, Sagamu on the patient's presenting with the case of urinary tract infection in Sagamu community of Ogun state.

### **Bacteriology**

#### ***Isolation and Identification***

The freshly collected mid-stream urine samples from 100 patients presenting with the cases of urinary tract infection were diluted serially to  $10^5$ . A loopful of the least dilution was swabbed

on a separately prepared Eosin Methylene Blue (EMB) and Mannitol Salt Agar (MSA). The plates were incubated at  $37^{\circ}\text{C}$  for 24hrs. The significant colonial growth were recorded as positive.

### **Biochemical Identification**

Biochemical characterization was conducted on the distinct metallic green selected isolates of *Escherichia coli* from eosin methylene blue and selected isolates of *Staphylococcus aureus* from manitol salt agar. The test includes Gram-staining, catalase test, indole test, hydrogen sulphide utilisation test, nitrate tests, urease test, coagulase and DNase test

### **Antibiotic Susceptibility**

The antibiotic susceptibility profiles of the isolates were determined by Kirby-Bauer method (slightly modified) using multidisc cartridge of the following antibiotics: amoxicillin, cloxacillin, gentamicin, nalidixic acid, oxacillin, ofloxacin, cotrimoxazole, nitrofurantoin and ampiclox. A typed standard *Staphylococcus aureus* and *Escherichia coli* typed strain was used as the control strain.

## **RESULTS**

Of the 100 mid-stream urine samples collected, 68 (68%) were from females while 32 (32%) came from males.

All the urine samples had pH varying from pH 6 - 7.5. Isolation procedure showed 48 of the 68 samples (66.7%) from females harboring *Escherichia coli* while the remaining 20 samples (28.7%) harboring *Staphylococcus aureus*.

The isolation ratio from males samples were 20 (62.5%) and 12(37%) for *Escherichia. coli* and *Staphylococcus aureus* respectively (Table 1). The cultural and biochemical observations recorded for the staphylococcal species distinguished clearly between the two species studied. Notably, the *Staphylococcus aureus* isolates were coagulase positive, catalase positive and were DNase positive, in sharp contrast to the *Escherichia coli* that produced greenish metallic sheen on eosin methylene blue, indole positive but are catalase negative and coagulase negative.

The age distribution pattern in relation to the source of infection in this study elicited 27 patient's as the highest, of which 25 are non-hospitalized while hospitalized patients are 2 within the age range 21-30years while only one non hospitalized sample was obtained within the age range 1-10 years as shown in Table 2.

*Escherichia coli* isolates elicited low susceptibility to amoxicillin (11.8%) and a high susceptibility to nitrofurantoin, (75%). *Staphylococcus aureus* isolates were sensitive to oxacillin (65.6%) but with notable resistance to nalidixic acid (40.6%) as shown in Table 2.

Table 1: Isolation Frequency

No. of Urine samples	No. positive for <i>Esch. coli</i>	No. positive for <i>Staph. aureus</i>
68 from females	48 (66.7%)	20(28.7%)
32 from males	20 (62.5%)	12 (37.5%)

Table 2: Age distribution of the patients in relation to the source of infection

Age (years)	Total number of sample	Non Hospital acquired	Hospital acquired
1-10	1	1	0
11-20	9	8	1
21-30	27	25	2
31-40	15	15	0
41-50	16	14	2
51-60	6	5	1
61-70	4	4	0
71-80	1	1	0
81-90	21	21	0
91-100	0	0	0
<b>Total</b>	<b>100</b>	<b>94</b>	<b>6</b>

Table 3: Antibiotics Susceptibility Profile of the Isolates

Antibiotic	<i>Esch coli: 68</i>		<i>S aureus: 32</i>	
	No sensitive	Percentage Sensitive	No sensitive	Percentage Sensitive
Amoxicillin	8	11.8	8	25
Cloxacillin	13	19.1	12	37.5
Gentamicin	25	36.8	10	31.3
Nalidixic	14	20.6	13	40.6
Oxacillin	33	48.5	21	65.6
Cotrimoxazole	38	55.9	6	18.8
Nitrofurantoin	51	75.0	16	50
Ampiclox	27	39.7	15	46.8

## DISCUSSION

The prevalence of urinary tract infection in this study from the data obtained showed that cases of UTI were resident more in the non-hospitalized than in the hospitals considering that 94% of the samples were obtained from the community against the 6% from the hospital cases. The sharp contrast in the samples collected from the two settings could be attributed to the preference of the populace to indulge in self-management of urinary tract infection.

The isolation rates of 66.7% (females) and 62.5% (males) for, *Esch. coli* showed a higher prevalence of this organism than *Staphylococcus aureus* (28.7 % for females and 37% for males). Nonetheless, this is an indication that the possibility of the occurrence of *Esch. Coli* alongside *Staphylococcus aureus* in UTIs should not be ignored.

The general prevalence of UTI could be a reflection of the environment associated with the individual cultural and hygiene practice which are considered to be amongst the epidemiological factors aiding the spread and control of an

infection. Resistance of *Esch. coli* to amoxicillin in this study is a known phenomenon the 11.8% susceptibility to the amoxicillin could be attributed to  $\beta$ -lactamase inactivation of this  $\beta$ -lactam antibiotic. Though, Amoxicillin and bacampicillin has been reported to reduces lactobacillus and multiply *Escherichia coli* which is a major uropathogen (Krieger *et.al.*, 2002).

Interestingly, *Escherichia coli* remains susceptible to cloxacillin and gentamicin and nalidixic acid. In this findings, 48.5% of the isolates of *Esch. coli* were sensitive to oxacillin while the 52.5% resistance recorded could be due to the production of extended  $\beta$ - lactamase while the 65.6% sensitivity of Staph aureus to oxacillin could be due to strain variation. The isolates of *Esch.coli* and Staph aureus in this study elicited varied resistance to cotrimoxazole, nitrofurantoin and ampiclox. The level resistance to the selected antibiotics could be associated with transferable R-plasmid encoding  $\beta$ -lactamase and this could account for the treatment failure associated with urinary tract infection (Nicolle, 2005).

The trend of resistance pattern elicited in this study expressed the possibility of increasing resistance episode which can be acquired and spread within the community of pathogen borne bacteria. Hence, its consideration in the screening of UTIs' urine sample for bacterial pathogens as being pertinent.

The predominant of urinary tract infection in feminine gender in this study could be due to the closeness of female urethra to the vagina introitus. There should be a continuous education or counseling of the general public on the need for rational use of antibiotics and also, increased personal hygiene observation should be advocated (Goldstein, 2000).

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