# Comparative Evaluation of the Susceptibility Pattern of Commonly used Antibiotics in the Treatment of Urinary Tract Infection.

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## ABSTRACT

*The agar disc diffusion method was used to evaluate the susceptibility pattern of commonly used standard antibiotics with the aim of identifying the most effective to address the problem of resistance. A total of two hundred and twenty (220) urine samples collected from 44 Army Reference Hospital and Yusuf Dantsoho Memorial Hospital, Kaduna Nigeria were evaluated and one hundred and forty one (141) samples were found to be positive for the presence of Escherichia coli and Staphylococcus aureus. Results of the sensitivity of the antibiotics showed highest zone of inhibition of 26±0.05mm due to the bioactivity of Pefloxacin (10µg) and the least zone of inhibition of 23±0.00mm due to the bioactivity of Zinnacef (20µg) against S. aureus while E.coli isolated from the positive samples had highest zone of inhibition of 26 ± 0.50mm due to the activity of Chloramphenicol at 30µg concentration level and the least activity was observed due to the effect of Augmentin at 30µg concentration level. Resistance was observed in the case of Amoxicillin, Pefloxacin and Tarivid against E.coli. In the case of S.aureus, resistance was observed when Ampiclox was used. The choice of antibiotic to treat urinary tract infection should be considered based on the susceptibility of the organism to the antibiotic.*

## INTRODUCTION

Urinary tract infection (UTI) is found to be associated with the various organs of the body through which urine is produced, stored and voided from the body. It is regarded as a serious health problem affecting millions of people[1].Infection is established when microorganism adhere to the opening of the Urethra which leads to its multiplication and eventually finds its way affecting the bladder and finally the kidney.

Cystitis, the infection of the bladder is the common urethritis infection of the urethra and Pyclonephritis which is the infection of the kidney are the commonest forms of urinary tract infection[2]. Microorganisms associated with urinary tract infection include *E.coli*, *S.aureus*, *Enterobacter spp*, *candida spp* and mycoplasma to name but a few. The prevalence of UTI is most common among pregnant woman due to several hormonal changes as already reported[3] and it is the most common form of admission in obstetrics ward among pregnancy women[3].

This work seeks to isolate and identify the most prevalent microorganisms in infected Urine of pregnant women with the aim of comparing the susceptibility of the organisms to commonly used antibiotics in order to address the problems of antibiotic resistance.

## MATERIALS AND METHODS

The bioassay method used was the agar disc diffusion method[4]. Mc Conkey sagar and Nutrients agar were used to isolate the organisms. Gram staining and biochemical methods[5] were adopted for identification and characterization of the identified organisms. Discs of standard antibiotics namely, perfloxacin (10μg), Gentamicin (10μg) Ampiclox (30μg), Zonnacef (20μg), amoxicillin (30μg), Rocephin (25μg) septrin (30μg), Erythromycin (10μg) and streptomycin (30μg) were used to evaluate susceptibility.

## RESULTS AND DISCUSSION

Urine samples of 220 pregnant women evaluated revealed that 141 samples were positive for urinary tract infection. Highest prevalence rate was observed in samples collected from the "44 Army Reference Hospital as indicated in Table 1 and least prevalence was from samples obtained from Yusuf Dantsoho Memorial Hospital, Kaduna Nigeria.

**Table 1**: Identified organisms from the urine inference

| Source of sample | No. Sample screened | Organism | NaCanage of occurrence isolates | Morphology isolate | Microscopy | Inference |
|---|---|---|---|---|---|---|
| 44 Army Reference Hospital | 120 | *S. aureus* | 42% | Yellow cream white circular colonies | Positive cocci in clusters | Sidue |
| | | *E.coli* | 41% | Elerated rose pink and flattened colonies | Gram negative rods | S. aureus |
| Yusuf Dantsoho | 100 | *E. coli* | 38% | Elerated rose pink and flattened colonies | Gram negative rods | E. coli identified |
| | | *S. aureus* | 20% | Isolates colonies appear as cream white and circular in shape | Gram positive cocci appearing in cluster | S.aureus Confirmed |

Table 1 indicates the percentage occurrence of two most prevalent organisms identified from the urine samples. Growth morphology of the colonies of the identified organisms as well as gram staining reaction is also indicated.

Table 2 indicated positive and negative biochemical confirmatory tests for the isolated organisms from the urine samples. *S.aureus* was positive for coagulase and catalase tests while *E. coli* was observed to be positive for Indole, increased citrate and triple sugar thus confirming the two organisms respectively.

**Table 2:** Biochemical confirmatory test for the identified organisms

| Isolates | Coagulate | Catalase | Indole | Increase | Citrate | Triple sugar |
|---|---|---|---|---|---|---|
| *S. aureus* | + | + | - | - | - | - |
| *E. coli* | - | - | + | + | + | + |

**Key**
**+ = Positive reaction**
**- = Negative reaction**

**Table 3:** Antibacterial Susceptibility test against the identified organisms

| Bacterial Isolate | ZONES OF INHIBITION IN MM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***S. aureus*** | **PEF** | **CN** | **APX** | **Z** | **AM** | **CH.** | **CPX** | **S** | **SXT** |
| | 26 ±2.6 26±0.05 | 24±0.05 | - | 23±0.00 | 24±0.20 | 26±0.00 | 24±0.00 | 26±0.00 | 24±0.50 |
| E. Coli | 26±0.00 | 22±0.00 | 17±0.00 | 14±0.00 | - | 26±0.50 | 17±0.00 | 24±0.00 | 25±0.00 |

**Keys:**

| | | | | | |
|---|---|---|---|---|---|
| PEF | - | Pefloxacin (10µg) | +++ | - | Intensive Zone of inhibition |
| CN | - | Gentamycin (10µg) | ++ | - | moderate Zone of inhibition |
| APX | - | Ampiclox (30µg) | + | - | Low Zone of inhibition |
| Z | - | Zinnacef (20 µg) | - | - | No Zone of inhibition |
| AM | - | Amoxacillin (30µg) | | | |
| CPX | - | Ciprofloxacin (10µg) | | | |
| SXT | - | Septrin (30µg) | | | |

Table 3 above shows the sensitivity pattern of the standard antibiotics against the test organisms measured as zones of inhibition in mm. Both *S. aureus* and *E. coli* had the hhighest sensitivity to perfloxacin (30µg) and chloramphemicol (30µg) with zones of inhibition ranging between 26±0.00 - 26±0.50mm respectively. The sequence of the active sensitivity to the antibiotics occurred in the order PEF>CH>SXT> CN>CPX>Z>AM>APX.

The findings of this work revealed that out of 220 Urine samples of pregnant women screened for the most prevalent bacteria associated with UTI, revealed that 42% of *S. aureus* occurred in samples obtained from the 44 Army Reference Hospital while 41% of E. coli was isolated from the same hospital as indicated in Table 1. Similarly, samples from Yusuf Dantsoho Hospital showed 38% occurrence of *E.coli* while *S. aureus* had 20% occurrence. The two most prevalent bacteria isolated from the samples were confirmed to be *S. aureus* and *E.coli* as indicated by the biochemical confirmatory tests (Table 2).

The predominance of *E. coli* and *S.aureus* over other bacterial pathogens in urine can be attributed to unique structure in gram negative bacteria which allows for attachment to the Uroepithelial cells that leads to multiplication and tissue invasion that finally results in pyelonephritis especially in pregnancy[6]. The presence of *E.coli* is also attributable to faecal contamination due to the closeness of genital opening to the urethal opening especially during pregnancy in which the enlargement of the Uterus affects the tissues of the urinary tract that facilitates entry of the organisms into the bladder causing an infection which leads to urinary tract infection[7]. *S. aureus* also being a part of the human normal flora of the skin and mucous membrane also due to contact of the hands and skin with the urethra probably lead to its entry into the urethra thereby causing an infection[8].

In this study, Gram negative bacteria (*E.coli*) total percentage prevalence (79%) was greater than the gram positive (*S. aureus*) with 62%. This agrees with literature [9,10].

*E.coli* has already been mentioned as the most common pathogen associated with the urogenital system as earlier reported by many researchers[11,12].

The results of the sensitivity of antibiotics against the *E.coli* and *S. aureus* show their resistance to the first line ground of antibiotics. For example ampiclox, was found completely ineffective on *S. aureus* (Table 3) while in the case of *E. coli* Amoxicillin, Tarivid (OFX) were not sensitive at all. Based on this finding it is therefore suggested that the choice of an antibiotics to treat urinary tract infection should be based on the sensitivity of the causative organism not on just mere assumptive use of an antibiotics with broad spectrum bioactivity.

## CONCLUSION

Antibiotic resistance is a big challenge to primary health care delivery. This study revealed that perfloxacin and chloramphenicol are the most sensitive antibiotics to the isolated *E.coli* and *S.aureus* from Unary tract. This study also suggest that

microscopy, culture and sensitivity bioassay should be carried out before prescription of antibiotics so as to check and minimize the problem of resistance and enhanced therapy. Further research is recommended to further ascertain the efficacy of antibiotics against organisms responsible for unary tract infection.

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