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Assessment of Urinary Tract Infections (UTI) among Male and Female Students of The Federal Polytechnic Nekede

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Abstract

Assessment of Urinary Tract Infections (UTI) among students in Federal Polytechnic Nekede Owerri was carried out using standard microbiological techniques. One thousand and fifty-six (1,056) mid-stream urine samples were collected from students, 30% males and 70% females, diagnosed with recurrent Urinary tract infections by the physicians of the clinic of Federal Polytechnic Nekede. The results obtained showed Total viable bacterial count from Female students' urine ranging from $3.6x10^5$cfu/ml to $9.0x10^7$cfu/ml while Total viable count from males ranged from $2.9x10^5$cfu/ml to $8.2x10^7$cfu/ml. Two sets each of the male and female urine samples harbored coliforms ranging from $4.0x10^4$cfu/ml to $2.0x10^5$cfu/ml while coliform count from male samples recorded $5.0x10^4$cfu/ml to $2.0x10^5$cfu/ml, the fungal count of the female samples ranged from 0cfu/ml to $3.2x10^6$cfu/ml while that of the male samples ranged from $7.0x10^4$cfu/ml to $1.0x10^6$cfu/ml. Keywords: Assessment, Infections, coliforms, diagnosed, mid-stream .

Keywords: Urinary Tract Infections, microbiological techniques, coliforms.

Introduction

According to the Centers for Disease Control and Prevention, Urinary Tract Infections (UTIs) are common infections that happen when bacteria, often from the skin or rectum, enter the urethra and infect the urinary tract ("Urinary Tract Infection | Community | Antibiotic Use | CDC," n.d.). These infections are reported to be the second most common type of infections in the body (Ojo & Anibijuwon, 2010), accounting for 8.3 million doctors' visits in the United States every year (Maurya & Singh, 2014). Women are especially prone to UTIs as forty (40) percent of women contract a UTI during their lifetime (Tan, 2016). The prevalence of UTIs in women is a function of the shortness of the female urethra which is closer to the anus than it is in men ("Urinary Tract Infection," 2019). Also, when vaginal flora is compromised, the causal agents of UTI thrive and so infection sets in. There is a very close relationship between loss of normal vaginal flora (especially, *Lactobacillus* species) and an increased risk of contracting a UTI ("Main UTI Causes. What makes you prone to UTIs? - Stop UTI forever," n.d.). Urinary Tract Infections are more prevalent in adult women as they are 30 times more likely to contract the infection during their life time ("Urinary Tract Infection," 2019) and one in three women experience UTI by the age of 24 (Foxman, 1997). Although UTIs are largely contracted by the female gender, the male gender also contracts these infections due to presence of stone or enlarged prostate, also HIV infections and anal intercourse may contribute to the infection of urinary tract (Maurya & Singh, 2014).

Gram negative and Gram positive bacteria as well as some fungi cause UTIs, with Uropathogenic *Escherichia coli* (UPEC) alone contributing to 80 per cent of cases and being responsible for both complicated and uncomplicated (Flores-Mireles *et al.*, 2015). Uncomplicated UTIs affect individuals who are otherwise healthy and have no structural or neurological urinary tract abnormalities and these infections are differentiated into lower UTIs (cystitis) and upper UTIs (pyelonephritis) (Tan, 2016).

A recent survey in the United States revealed that amongst women who were >18 years of age, 10.8% of them reported at least 1 presumed UTI in a year, and a large number of the women with UTI history, have experience at least 2 episodes of these infections in their lives (Foxman, 2002). These findings formed a major part of the decision to carry out this research, this is because the average age of students in the Federal Polytechnic Nekede, fall within the 18-30years coupled with the fact that the sanitary conditions of their living areas may enhance the contraction of these infections and also the sexual activities engaged by the students.

Materials and Methods

At total of one thousand and fifty-six (1056) samples were collected from students diagnosed with recurrent Urinary tract infections by the physicians of the clinic of Federal Polytechnic Nekede. Seven Hundred and Thirty-Nine were female while Three Hundred and Seventeen were male. Early urine samples were collected midstream from male and female students of microbiology using sterile specimen containers and taken to the laboratory for microbiological analysis of the urine samples.

Microbiological Analysis of Urine Samples

One milliliter (1ml) of the samples was aseptically collected using sterile Pasteur pipettes and placed in nine milliliter (9ml) of sterile water contained in a test tube and allowed to stand for 5 minutes and then one milliliter (1ml) of the wash water was serially diluted using ten-fold serial dilution. After the serial dilution, 0.1ml of the 10^{-3} dilution was aseptically inoculated onto sterile plates of Nutrient agar, MacConkey agar and SDA standard culture media for enumeration of microorganisms. After inoculating the sterile media, they were incubated at 37^0C for 24 hours for the bacteriological media. After the incubation periods, the microorganisms enumerated on the culture plates were counted using the colony counter.

The microbial isolates obtained were thereafter identified using cultural morphology. The bacterial isolates were further characterized using gram staining and biochemical tests while the fungal isolates were further characterized using lacto phenol cotton blue staining techniques.

Identification of Bacterial Isolates

The bacterial isolates from the plates were identified by gram staining and biochemical tests.

Gram Staining Techniques

A smear of each of the bacterial isolates was made and fixed by air drying. The smears were then covered with crystal violet stain for 60 seconds and rapidly washed off with water thereafter. The smears were then covered with Lugol's iodine for 60 seconds and washed off with water. The smears were decolorized with acetone alcohol and washed off after 10 seconds. The smears were finally flooded with safranin for 2minutes and washed off with clean water. The back of the slides was then wiped and placed in a draining rack for the smear to dry before they were viewed with x 40 oil immersion objective lens (Cheesebrough, 2006). Gram positive bacteria gave purple coloration while gram negative bacteria gave pinkish coloration.

Spore Staining

A smear of each of the bacterial isolates was made on a clean grease–free slide and fixed by air drying. The smears were then covered with malachite green and placed over steam for 5 minutes while topping the slides with more malachite green when they are dried out. At the end of 5 minutes, the smears were washed off with clean water and counter stained with safranin for 2 minutes and washed off with water. The smears were then allowed to dry before they were viewed with x 40 oil immersion objective lens (Fawole & Oso, 2001). Spore positive slides gave a co-appearance of pink and green color while negative slides gave only pinkish coloration.

Motility Test

Half strength nutrient agar was prepared, 14 grams per liter. 10mls of the prepared half strength agar was added in tubes and allowed to solidify. A straight wire

was used to pick the test organism and stab inoculate the tube in an upright position and incubate for 18 hours. Motile organisms will grow away from the wire of stab whi988le non motile organisms will grow along the line of stab.

Catalase Test

This test is used to differentiate those bacteria that produce the enzyme catalase such as staphylococci from non-catalase producing bacteria such as streptococci. About 2ml of hydrogen peroxide solution was poured into several test tube for each of the bacterial isolates. Using a sterile wooden stick, each colony of the bacterial isolates was immersed in each of the hydrogen peroxide solution. Active bubbling within 10 seconds is an indication of a positive test while non is an indication of a negative test (Cheesebrough, 2006).

Citrate Utilization Test

This test helps in the identification of Enterobacteriaceae. Each of the test organisms were inoculated into sterile agar slopes of simmon citrate agar in each case using stab inoculation technique. The inoculated agar slopes were then incubated at 37^{o}C for 24 hours. A bright blue coloration is an indication of a positive test while non is an indication of a negative test (Cheesebrough, 2006).

Indole Test

Some microorganisms are capable of hydrolyzing the amino acid Tryptophan and one of the end products is indole. The ability of a microbe to carry out this reaction can be used for biochemical characterization. The test organisms were suspended in sterile peptone (about 3ml) preparation in sterile test tubes and incubated at 37^{o}C for 48 hours after which 0.5ml of kovac's reagent was added and shaken gently. A red coloration in the surface layer within 10 minutes is an indication of a positive test while non is an indication of a negative test (Cheesebrough, 2006).

Oxidase Test

The method outlined in District Laboratory Practice in Tropical Countries was adopted for this test (Cheesebrough, 2006). A piece of filter paper was placed in a clean Petri-dish and three drops of freshly prepared oxidase reagent was added in each case of the test organism. With a sterile piece of stick, each colony of the test organism was removed and smeared on each oxidase reagent drop on the filter paper. The development of a blue-purple coloration is an indication of a positive test while none is an indication of a negative test.

Sugar Fermentation Test

Each colony of the different test organisms were inoculated onto sterile agar slopes of triple sugar iron agar using stab inoculation. After this, the inoculated, agar slopes were incubated at 37^{O}C for 24 hours. The different colors of the slopes and butts in addition to the presence of gas production and Hydrogen Sulphide (H_2S) blackening is indicative of the type of bacteria present (Cheesebrough, 2006).

Results and Discussion

The results of the microbial load of the urine samples revealed that the Total viable bacterial count of the urine samples from Female students ranged from $3.6x10^5$cfu/ml to $9.0x10^7$cfu/ml while the Total viable count of the urine samples from male ranged from $2.9x10^5$cfu/ml to $8.2x10^7$cfu/ml. Two sets each of the male and female urine samples harbored coliform in the range of $4.0x10^4$cfu/ml to $2.0x10^5$cfu/ml while coliform count of the male samples recorded $5.0x10^4$cfu/ml to $2.0x10^5$cfu/ml, the fungal count of the female samples ranged from 0cfu/ml to $3.2x10^6$cfu/ml while that of the male samples ranged from $7.0x10^4$cfu/ml to 1.0 $x10^6$cfu/ml. The female samples relatively had higher microbial load than the male samples. Previous authors have reported the microbial load of urine samples, stated that the female students of Ado Ekiti recorded microbial load greater than 10^5cfu/ml (Ojo & Anibijuwon, 2010). This is in agreement with the result of this study. The results of the identification of the bacterial isolates revealed the presence of *Staphylococcus aureus*, *Klebsiella* spp, *Streptococcus* spp, *Proteus* spp, *Escherichia coli*, *Bacillus* spp and *Serratia* spp, *Candida* spp and *Geotrichum* spp. Similar study also reported the presence of *Staphylococcus* spp, *Streptococcus* spp, *Proteus* spp and *Klebsiella* spp (Ojo & Anibijuwon, 2010).

The study implicated six microorganisms as possible aetiological agents of the UTI cases observed. These organisms; *E. coli*, *Proteus* spp., *Klebsiella* spp., *Staphylococcus* spp., *Streptococcus* spp., and *Pseudomonas* spp. are the common causative agents of urinary tract infections. This higher prevalence *E. coli* (32.75%) may be due to fecal contamination, the

predilection of the organisms from the toilets and the shortness of the female urethra (Foxman, 2002). This prevalence however is also reported in earlier works where they found out that *E. coli* accounts for 32% of UTI cases (Oyaert et al., 2018). There is also a possible link between the prevalence of UTI among students and the level of personal hygiene or the state of toilet facilities in the hostel. Most of the students examined rated the hostel toilets as bad. Sexual activities are another factor that predisposes people to UTI. *Staphylococcus aureus.* For example, which is a member of skin flora might stay on the skin and get transmitted during sexual intercourse.

Conclusion and Recommendation

This work has shown that the student whose urine samples were analysed in this study had Urinary Tract Infection since their Total viable count were up to 10^5cfu/ml. The aetiological agents identified were *Staphylococcus aureus, Escherichia coli, Proteus* spp., *Klebsiella* spp., *Streptococcus* spp. and *Candida albicans.*

The following are therefore recommended:

1. That students should adopt good personal hygiene to reduce cases of UTI
2. That students should be sensitized on the dangers of promiscuity as a predisposing factor to acquiring Urinary Tract Infections.
3. That persons infected with Urinary Tract infections should go for chemotherapy.
4. That female students should stop the use of unsterile tissue paper in cleaning up after urinating

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