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Full Length Research Paper

Urinary tract infection among female students residing in the campus of the University of Ado Ekiti, Nigeria

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Seven hundred and eighty (780) female students residing in the campus of the University of Ado Ekiti were examined for significant bacteria indicative of urinary tract infections. Analysis of their clean-voided, midstream urine revealed that 507 (65%) female students have significant bacteria, 146 (18.75%) indicated insignificant bacteria while 127 (16.25%) showed no growth. Fifty eight (58) bacterial isolates were obtained from samples positive for bacteria. 8 (13.8%) were sensitive to streptomycin, 7 (12.1%) to tetracycline, nitrofurantoin and ampicillin, while only 4 (6.9%) isolates were sensitive to dalacine. However, bacterial isolates obtained from this survey generally showed similar pattern of resistance to antibiotics. The fifty-eight (58) bacterial isolates were tentatively characterized into six genera. The frequencies of occurrence of the bacterial species are in the order: *Escherichia coli* (32.75%), *Proteus* sp. (17.25%), *Klebsiella* sp. (13.79%), *Staphylococcus* sp. (12.07%), *Streptococcus* sp. (8.63%) and *Pseudomonas* sp. (5.17%). However, 6 (10.34%) of the isolates were unidentified.

Key word: Female student, university campus, bacteria, antibiotics, resistance.

INTRODUCTION

Urinary tract infections (UTI) are serious health problems affecting millions of people each year. They are the second most common type of infections in the body, accounting for about 8.3 million visits to the hospitals each year (UDHHS, 2004). UTIs are caused by the presence of bacteria in urine, although fungi and viruses could be involved. Majority of women have recurrent infection within one year (Siiri et al., 2009) . *Escherichia coli* causes 75 - 90% of uncomplicated UTIs (Karen et al., 2006) whereas *Staphylococcus saprophyticus* causes an estimated 5 - 15% of UTIs frequently in younger women (Micheal et al., 2007). *Enterococcus* and other gram negative rods other than *E. coli* have also been implicated in some cases (Benjamin et al., 2009).

Significant bacteria is defined as the persistent isolation of > 10^5 colony forming units (cfu) of bacteria per ml of clean voided, mid-stream urine specimens plated within 6 h of collection. In females, it is possible that slow growing microaerophiles such as *Lactobacillus, Corynebacterium* and *Streptococcus mileri* may be involved in the pathogenesis of urinary tract infections. Symptoms are usually precipitated by sexual intercourse (Micheal et al., 2007).

UTIs occur in both acute and chronic forms. In the former, patients complain of severe and low back pain that may associate with fever due to the associated bacteraemia, while in the latter, a sensation of perennial fullness is felt. The common causative agent is *E. coli* but micrococcal infections may account for up to 10 - 20% of cases in sexually active women (Vorland et al., 2001). This infection reaches the bladder by the ascending route, with the main symptoms as urinary frequency and dysuria. Other infections that are due to less common pathogens usually occur in the presence of gross structural abnormality of the urinary tract or neurological effects.

The common source of *E. coli* infections in women is the faecal flora. Introital colonization precedes the development of urinary tract infections in women and girls. In males, the organisms frequently originate from the sub pepucial sac. The higher prevalence in females as compared with males is attributable to the shortness of the female urethra and so is more liable to contamination during sexual intercourse, urethra massage and even

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Table 1. Prevalence of isolates.

Isolates	Percentage
Escherichia coli	32.75
Klebsiella sp.	13.79
Staphylococcus sp.	12.07
Streptococcus sp.	8.63
Proteus sp.	17.25
Pseudomonas sp.	5.17
Unidentifiable Isolates	10.34
Total	100.00

urination with chronic flora that resides in the perineal skin. It also includes the effect of turbulence of the urinary stream (Starr and Taggart, 2002).

This present work is carried out in order to determine the prevalence of UTI in female students residing in the campus of the University of Ado Ekiti largely because of the unavailability of basic infrastructural facilities like pipe borne water and good toilet. Also the use of antibiotics among this category of student is largely uncontrolled.

MATERIALS AND METHOD

Study population

Seven hundred and eighty female students residing in the campus of the University of Ado- Ekiti were recruited for this study. Each of these students gave a written consent of their willingness to participate in the study.

Collection of urine specimen

Clean-voided, mid-stream urine (msu) specimens were collected from 780 female students residing in the campus of the University of Ado-Ekiti. Each of the students was instructed on the mode of collection of the msu that is, during forceful urination after the first 10 - 20 ml has been voided. Subjects were adequately educated on precautions to prevent contamination of specimen. The specimens were collected into sterilized, wide necked, leak proof, plastic universal containers obtained from HD Supply, Aylesbury, UK.

Microbiological analysis

Primary isolation was done on nutrient agar to allow the growth of all bacteria in the urine. Each specimen of urine was shaken properly to ensured homogeneity. Ten fold serial dilutions were made of each specimen and 1 ml of the appropriate dilutions (10^{-5}) was used as inoculum using the pour plate method (Nonzon et al., 2002) . Plates with growth were indicated as significant bacteria while plates that showed growth only at 10^{-3} dilution were indicated as insignificant bacteria. However, plates that did not show growth at 10^{-3} dilution were recorded as negative.

Identification of organisms

All bacterial isolates were characterized on the basis of colonial morphology, cellular morphology, reaction to Gram's stain, motility test (Fawole and Oso, 1998) and biochemical tests. The tentative identities of the isolates were obtained from Bergey's Manual of Determinative Bacteriology (Bucchanan and Gibbons, 1974).

Sensitivity tests

Diagnostic sensitivity test agar (DST agar) was used for antibiotics sensitivity test. The method described by Sighn et al. (1997) was employed. The bacterial isolates were subjected to *in vitro* susceptibility tests against some common third generation antibiotics.

RESULTS

A total of five hundred and seven (507) of the 780 students urine examined have significant bacteria count of more than 10^5 cfu/ml while 147 students have insignificant bacteria count (< 10^5 cfu/ml) . The other 126 students were regarded as negative for bacteria (< 10^3 cfu/ml) (Table 1). These results indicated that 65% of the students were significant for bacteria, 18.85% had insignificant bacteria while 16.15% were negative for bacteria.

A total of fifty eight (58) bacterial isolates were obtained from the urine specimens that indicated the presence of bacteria in them. The isolates were tentatively identified to belong to six (6) genera including *Escherichia, Klebsiella, Staphylococcus* sp*., Streptococcus* sp*., Proteus* sp*.* and *Pseudomonas* sp*.* The frequency of occurrence of these organisms is shown in Table 1. *E. coli* showed the highest prevalence (32.75%) and *Pseudomonas* (5.17%) has the least prevalence.

The demographic distribution of significant bacteria specimens by age is shown in Figure 1. Specimens from students within the sexually active ages of 16 and 30 years revealed unusually high bacterial count in their urine (62.6 - 70.3%). The bacterial isolates had varied degrees of sensitivity to the antibiotics used (Figure 2). Eight (13.8%) of the 58 isolates were sensitive to streptomycin, 7 (12.1%) to tetracycline, nitrofurantoin and ampicillin while 4 (6.9%) isolates were sensitive to dalacine.

DISCUSSION

Seven hundred and eighty (780) urine specimens were examined for presence of bacteria or otherwise. Five hundred and seven (65%) were found positive for urinary tract infections; having not less than 10^5 colony forming units of bacteria per 1 ml of clean voided, mid-stream urine. However, 147 (18.85%) other specimens have insignificant or doubtful bacteria having less than 10^5 cfu of bacteria per 1 ml. This could be due to indiscriminate consumption of antibiotics by the students since some of them confessed using non prescribed antibiotics whenever difficulty in urination is noticed. The doubtful bacteria

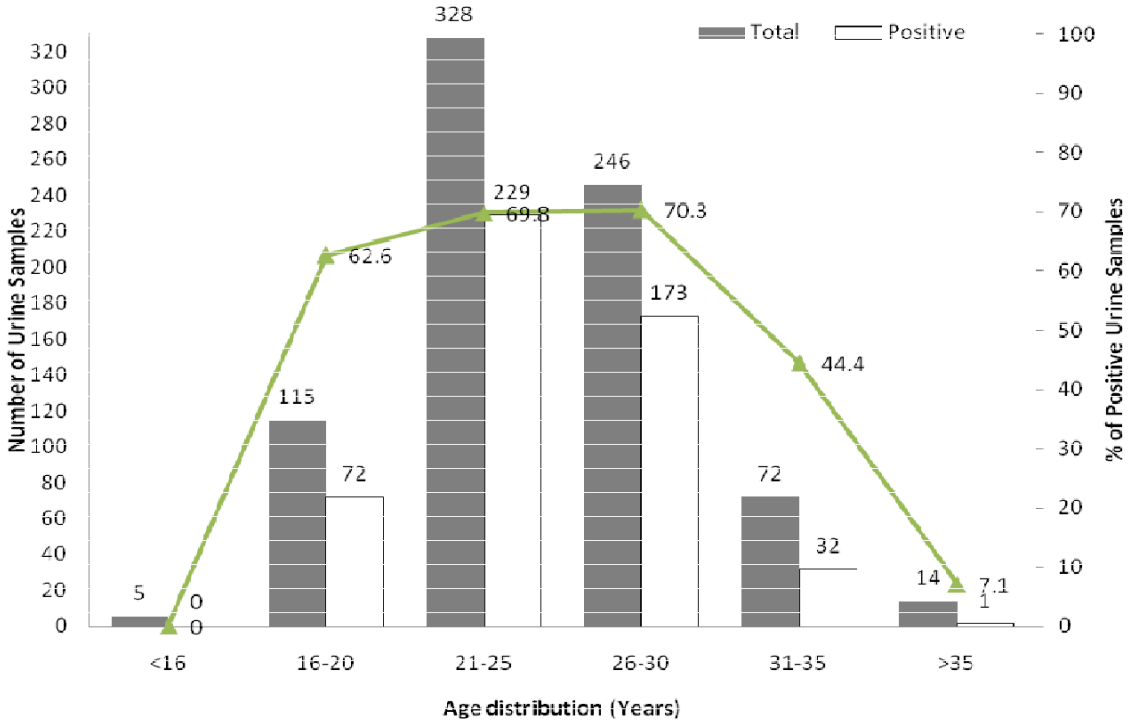

Figure 1. Demographic distribution of urine specimens by age.

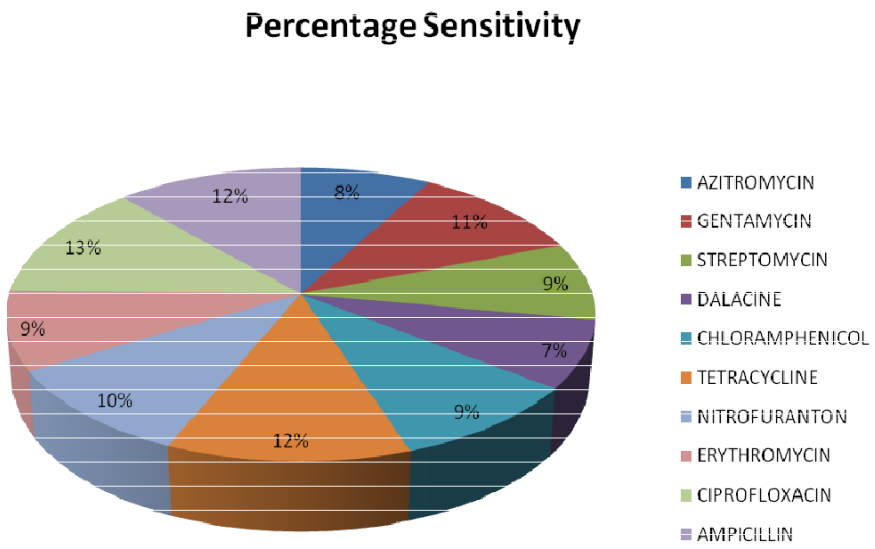

Figure 2. Sensitivity of bacteria isolate to antibiotics.

could also be due to contaminations during specimen collection. Although, the students were educated on how to collect the specimens aseptically, maximum efficiency cannot be guaranteed since most of the students are not sterility conscious.

From the private interviews conducted with the students, it was observed that most of the UTI cases were asymptomatic except for very few cases. Most of the students do not experience lower abdominal pain, difficulty in urination and other characteristic symptoms of UTI, but have significant bacteria.

The study implicated six microorganisms as possible aetiological agents of the UTI cases observed. These organisms; *E. coli, Proteus sp., Klebsiella sp., Staphylo-*

coccus sp., Streptococcus sp. and *Pseudomonas sp.* are the common causative agents of urinary tract infections as earlier reported by Mars (2002); James et al. (1976), Meers et al. (1990). This higher prevalence of *E. coli* (32.75%) may be due to faecal contamination, the predilection of the organisms from the toilets and the shortness of the female urethra. (Nicolle, 2001). This prevalence however, is also reported in earlier works by Smith et al. (2003) where they found out that *E. coli* accounts for 32% of UTI cases. *Proteus sp.* with 17.25% prevalence has a significant association with UTI. Its active motility and swarming ability can in comparison with other organisms transverse easily through the urethra. Other organisms implicated were *Klebsiella sp.* (13.79%), *Staphylococcus sp.* (12.07%), *Streptococcus sp.* (8.63%) and *Pseudomonas sp.* (5.17%). Six of the positive cases were caused by a mixed culture of these organisms accounting for 10.34%.

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 hostels. Most of the students examined rated the hostel toilets as bad. Bad, in this context implies that there is no adequate supply of water to clean and flush the toilets regularly. When dirty therefore, there is an accumulation of urine sediments forming a thick scum. In this case students could become infected during urination. Sexual activity is 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 Figure 1 gives a demographic situation of the cases examined by age. It was observed that majority of the positive cases fall between age 23 and 26 years. 58% of the total sample population falls within this bracket inferring that most final year students are sexually active. 16% are above 26 years while none falls under 19 years. Sexual activity enhances better transmission of UTI especially in females, who usually have higher prevalence of UTI than males.

In this study, it was observed that the susceptibility of the isolates to the ten antibiotics differs with the species. A particularly remarkable result was obtained with gentamycin and ciprofloxacin. Figure 2 shows that out of the 58 isolates, 25% were sensitive to ciprofloxacin and 5% were resistant. Earlier researches also revealed that the success of ciprofloxacin could be due to its broad spectrum activities, its bactericidal activity on organisms both in replicating and resting state and its ability to disrupt DNA functions leading to the death of the bacterium. Gentamycin was also similar in action recording 20% sensitive cases. It is equally highly recommended. Drugs like tetracycline, ampicillin and streptomycin have a relatively fair activity on isolates with 11, 11 and 10% activities respectively; though the recorded high level of resistance could be due to the cheap price and affordability of these drugs. It appears very common and closer to the students (and the general populace). The implication of this is the possibility of easy access causing self medication, misuse and abuse, leading to the development of resistance. On the other hand, Dalacine recorded a very poor performance with 1% sensitivity. Antibiotics like ciprofloxacin (Cp) at 1 μg and Gentamycin (G) at 10 μg showed excellent sensitive inhibitory actions while activity of Chlindamycin/Dalacine (D) at 10 μg is not commendable. Its inactivity in UTI cases is attributable to the fact that it was manufactured for activity against anaerobic microorganisms and not aerobes as the case is for the isolates. It is therefore not recommended.

Conclusively, a high incidence of UTI was demonstrated among the female students residing in the campus of the University of Ado- Ekiti, Nigeria. Those that had a non significant UTI as at the time of this assay were also high while those that are negative were only 127 (16.3%). As earlier reported by several workers *E. coli* was also implicated as the most common causative agent of UTI among female students of this University. We therefore recommend that factors that promote the occurrence of UTI in our campuses should be addressed promptly.

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