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Urinary candidal and bacterial infections among asymptomatic students of Niger Delta University living in Amassoma, Bayelsa State

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Abstract

This study was carried out to determine the prevalence of urinary tract infections (UTIs) among asymptomatic Niger Delta University (NDU) undergraduate students living in Amassoma, Bayelsa State. Two hundred first morning mid-stream urine samples collected from August to September, 2014, were assayed microbiologically for pathogenic organisms. The samples were cultured on Cystine Lactose Electrolyte Deficient (CLED) agar, MacConkey agar and Blood agar (for bacterial growth) and Saboraud dextrose agar (for fungal growth). The isolated organisms were identified using standard techniques (microscopy, biochemical tests, germ tube test and Gram stain). The overall prevalence of urinary tract infection was 6%. Females (75%) were significantly more infected than males (25%). The age range 15-20 and 26-30 years in females had the highest rate while 21-25 had the highest in males. The microorganisms isolated were *Candida albicans* as the most common (50%) followed by *Staphylococcus aureus* (33.33%), *Escherichia coli* (8.33%) and *Pseudomonas aeruginosa* (8.33%). There is, therefore, the need for education on hygiene and other predisposing factors to reduce the prevalence, especially of *C. albicans*. Routine laboratory investigations in asymptomatic individuals is also recommended.

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Introduction

Urinary tract infection (UTI) is a condition in which one or more parts of the urinary system (the kidneys, ureters, bladder and urethra) become infected by microorganisms. This may lead to cystitis and pyelonephritis. The normal urinary tract is sterile but gets infected by the normal flora acting as opportunistic pathogens (Mekerrow *et al.,* 1984). Urinary tract infections (UTIs) are caused by the presence of microorganisms in urinary tract such as fungi, bacteria and viruses. In young sexually active women, sex is said to cause 75–90% of bladder infections, with the risk of infection related to the frequency of sex. Indwelling urinary catheters is also a predisposing factor (Akerele *et al*., 2000).

Candida species are among the fungi which cause UTIs. Notable among these species is *C. albicans* which is frequently reported in literature to be the most commonly isolated, although several other species have been implicated too. Okungbowa *et al.* (2003) reported that *C. glabrata* was the most frequent isolate in their study. Predisposing factors for bacterial infection of the urinary tract are almost the same for urinary candidiasis some of which have also been reported by Oviasogie and Okungbowa (2009). Urinary tract infection is one of the major diseases that affect people of all age groups and sexes especially those who are sexually active. It can be separated into asymptomatic and symptomatic cases based on the pathogenesis of infection (Azubike *et al.,* 1994). Infected individuals may be asymptomatic. The clinical manifestation of UTIs may vary with age and the part of the urinary system that is affected. The most common symptoms of a bladder infection in adult are burning sensation with urination, frequent urination, and urge to urinate, with or without vaginal discharge or significant pain (Nicolle, 2008). An upper urinary tract infection may additionally present with flank pain and a fever. Other signs of UTI include foul smelling urine that appear cloudy. The diagnosis of urinary tract infections is usually confirmed by microscopy, culture and sensitivity (MCS) and biochemical or serological assays of properly collected urine samples (Mekerrow *et al.,* 1984).

Antibiotics and antimycotics are the main treatment for UTIs. The choice of drug depends on many factors including whether the infection is complicated or uncomplicated or primary or recurrent. Treatment decisions are also based on the type of patient (a man or woman, a pregnant or non-pregnant woman, child, hospitalized or non-hospitalized patient or person with diabetes) (Gupta *et al.,* 2010). Although a number of studies on urinary tract infection in the country have been carried out, the information available on its prevalence in students of NDU is scanty. Therefore the objectives of the study were to determine the prevalence of urinary tract infection among NDU students living in Amassoma, Wilberforce Island, Bayelsa State and to identify the causative organisms and make recommendations.

Materials and methods

Study area

The research was carried out in NDU, Wilberforce Island, Bayelsa State in Southern Nigeria. Established in the year 2000, it is about 30km from Yenagoa, the Bayelsa State capital. The University has a population of more than 10,000 students (www.ndu.edu.ng. Accessed 18 May, 2014).

Study population

Urine samples were collected from two hundred asymptomatic male and female students residing at different hostels (the main campus, the College of Health Sciences campus and the various hostels outside the campuses). The age range of the students was 15-30 years.

Ethical consideration

The ethical procedure of the University was followed. The students voluntarily gave their consent to take part in the study.

Sample collection

Twenty milliliters of early morning mid-stream urine was aseptically obtained from each subject in a dry wide-necked, leak proof, screw capped container and was identified by a code. The female students were instructed to clean the area around the urethral opening with potable water and dried before collecting the urine with the labia held apart while the male students were asked to wash their hands before collecting the specimen. The samples were analyzed microbiologically within an hour of collection. Samples were collected from 63 males and 137 females.

Sample analysis

Macroscopy, culture and microscopy

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Macroscopic features such as colour of the samples as well as their clarity or turbidity (clear or cloudy) were observed and reported. For culturing, the samples were mixed by rotating the container, and a sterilized wire loop was used to transfer a loop-full of urine on a plate of Blood agar, MacConkey agar, CLED (cystine lactose electrolyte deficient) agar to isolate bacteria, and Saboraud dextrose agar (SDA) for fungal isolation. The plates were incubated aerobically at 37^0C for 24 hours (for bacteria) and 48 hours (for fungi). On the second day, plates were examined for growth and characteristic colonies of the different isolates were noted (Cheesbrough, 2000).

About 10 ml of well mixed urine was transferred to a labeled test tube and centrifuged at 2500 rpm for 5 minutes. The supernatant was discarded and the sediment was remixed by tapping the bottom of the tube. A drop of the well mixed deposit was transferred to a clean glass slide and covered with cover slip. The preparation was examined microscopically using x10 and x40 objectives with the condenser iris closed sufficiently to give good contrast. Samples with ≥ 4 pus cells/hpf were regarded as having significant infection pyuria (Cheesbrough, 2000).

Biochemical tests

Biochemical tests (catalase, coagulase, indole, urease, citrate and oxidase) and Gram-Staining were done according to standard methods (Cheesbrough, 2000).

Germ tube test for Candida albicans

This was done to identify *Candida albicans*, using human serum (Cheeshbrough, 2000; Okungbowa *et al.*, 2003)

Statistical analysis

The data generated were analysed statistically using prevalence rate, percentage frequency and Analysis of Variance (ANOVA).

Results and Discussion

Out of 200 samples, 12 (6%) from 9 females (representing 75% of the 12 positive samples) and 3 males (25%) showed significant microbial growth, as shown in Table 1. Each sample yielded a single organism, giving rise to 12 isolates. Among the 12 isolates, *Candida albicans* showed the highest prevalence of 6 (50%) followed by S*taphylococcus aureus* 4 (33.33%) while *Escherichia coli* and *Pseudomonas aeruginosa* had equal frequency and percentage 1 (8.33%) each (Figure 1).

Table 2 shows the age distribution of UTI in males. A high percentage of organisms were isolated from males within the age brackets of 21–25 years (67%) followed by 15–20 years (33%) while age 26 – 30 years had no isolates (0%). The age distribution of female subjects whose samples had significant microbial growth is represented in Table 3. A high percentage of organisms were isolated from females within 15-20 years (44.4%) and 26-30 (44.4%) followed by 21–25 years (11.2%) who had urinary tract infections.

Table 1: Prevalence of urinary tract infection based on sex

Sex	Total No of Samples Examined	Cases With Significant Bacterial Growth	Cases With No Significant Bacterial Growth
Male	63	3 (25%)	60 (32%)
Female	137	9 (75%)	128 (68%)
Total	200	12 (6%)	188 (94%)

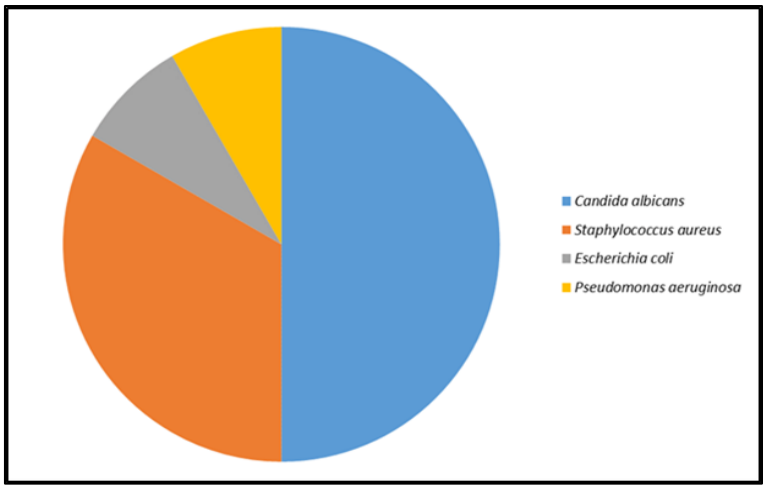

Figure 1: Prevalence of total isolated microorganisms

Table 2: Age distribution of urinary bacterial infection in males.

Age (years)	Total number of samples examined	Cases with significant microbial growth	Cases with no significant growth
15-20	19	1 (5.26%)	18 (94.74%)
21-25	33	2 (6.10%)	31 (93.94 %)
26-30	11	0 (0%)	11 (100 %)
Total	63	3 (4.76%)	60 (95.24%)

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The overall prevalence of UTI was found to be 6% in this study and this rate is lower than the 11.9% reported by Aiyegoro *et al.* (2007) among children and adolescents in Ile-Ife, 22% by Ekweozor and Onyemenen (1996), 25.6% by Nedolisa (1998) and 36.68% by Mehta *et al.* (2013). Factors responsible for the varied rates are probably age, level of education, sexuality, personal and environmental hygiene and socio-economic status. Besides, samples were collected randomly from asymptomatic students; the prevalence would be expectedly lower than if symptomatic subjects were used. This also supports the suggestion of local and regional differences in UTI prevalence (Kolawole *et al.*, 2009).

The UTI was higher in females (75%) than males (25%). Females of the age 15 – 20 and 26 – 30 years had equal percentage rate (44.4%) followed by 21 – 25 years (11.1%). Previous reports have shown that females are more prone to UTI than males during adolescence and adulthood (Kebira *et al.*, 2009). The main cause of high prevalence of female UTIs is the shorter urethra; its close proximity to any sexual activity (Adedeji and Abdulkadir, 2009) could also aid the spread of normal flora in faecal material from the anus to the vagina from where the bladder could be infected as a result of poor anal cleaning (Azubike *et al.*, 1994).

Other reasons besides those mentioned earlier to justify higher UTI prevalence rate in females are the use of spermicides and diaphragm as contraceptives by them. It has been reported that diaphragms push the urethra and make it harder to completely empty the bladder and therefore the residual urine in the bladder is more likely to grow bacteria and cause infections (Kolawole *et al.*, 2009).

The high incidence (44.4%) of UTI in females of age groups 15 - 20 and 26 – 30 years corroborates other reports (Omigie *et al.*, 2009; Okungbowa *et al.*, 2003; Dimitrov *et al.*, 2004; Okungbowa *et al.*, 2006). These young students are characteristically vulnerable to increased sexual activity which predisposes them to UTI as earlier reported (Oladeinde *et al.*, 2011) and the age that most commonly abuse antibiotics.

The study implicated four micro-organisms as possible etiological agents of the UTI cases observed in NDU. These organisms were *Candida albicans, Staphylococcus aureus, Escherichia coli* and *Pseudomonas aeruginosa*. *Candida albicans* is an opportunistic fungal pathogen which causes urinary tract infection in human, especially immunocompromised patients (Cheesbrough, 2000).

Table 3: Age distribution of urinary bacterial infection in females

Age (years)	Total number of samples examined	Cases with significant microbial growth	Cases with no significant growth
15-20	65	4 (6.15%)	61 (93.85%)
21-25	52	1 (1.92%)	51 (98.10%)
26-30	20	4 (20.0%)	16 (80.0%)
Total	137	9 (6.57%)	128 (93.43%)

Recent studies have shown that prolonged hospitalization, immunocompromised patients, uncontrolled use of antibiotics, catherization of the urinary tract, prophylaxis by antifungal agent, surgeries, long period stays in intensive care units and pregnancy are some factors which predispose individuals to urinary candidiasis (Oviasogie and Okungbowa, 2009; Zarei *et al.*, 2009). *Candida albicans* is the causative fungus for 50% to 70% of all cases of urinary fungal infection.

Staphylococcus aureus had a frequency of 33.33% which is similar to the finding of Onanuga and Awhowho (2012) who reported a recovery rate of 33.6% in Yenagoa, Bayelsa State and 35.6% by Akerele *et al.* (2000) in Benin City. *Staphylococcus aureus* is a Gram positive cocci organism which is an opportunistic pathogen affecting both immunocompetent and immunocompromised individuals. The organism is reported to be the second most prevalent pathogen in UTIs (Akerele *et al.*, 2000).

Escherichia coli had the lowest frequency of 8.33% different from previous findings (Smith *et al.*, 2003). Again, the prevailing predisposing factors could be responsible for these differences. *Escherichia coli* is the commonest urinary pathogen causing 60 – 90% of infections. Number of samples and geographical location could be adduced for the 8.33% recorded in this study. *Pseudomonas aeruginosa* had the same frequency as *E. coli* (8.33%) It is a Gram negative bacillus (Rajesh and Rattan, 2008).

Conclusion

The fact that the subjects were asymptomatic and yet cultures yielded microbial growth in 6% of samples suggests that routine laboratory investigations be done at regular intervals so as to prevent spread of infection and reduce the incidence of cystitis and pyelonephritis among NDU students. It is recommended that the students be educated on personal hygiene and other factors that will help in the reduction of the prevalence of *C. albicans* and the other microorganisms. The age groups 21 – 25 in males and 15 to 30 in females, should be the main targets as these age groups recorded the highest infection rates.

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