African Journal of Microbiology Research Vol. 5(20), pp. 3233-3236, 30 September, 2011
Available online at http://www.academicjournals.org/AJMR
DOI: 10.5897/AJMR11.279
ISSN 1996-0808 ©2011 Academic Journals

*Full Length Research Paper*

# Urinary tract infection in apparently healthy individuals in Ile-Ife, Nigeria: Detection of predominant microorganisms and antibiotics susceptibility profile

**Onifade A. K.[1], Anibijuwon I. I.[2]* and Azariah E. J[1]**

[1]Department of Microbiology, Federal University of Technology, Akure Ondo State, Nigeria.
[2]Department of Microbiology, University of Ilorin, Ilorin, Nigeria.

Accepted 23 August, 2011

**The incidence of urinary tract infections in apparently healthy individuals was conducted in Ile –Ife, Osun State, Nigeria. A total of 500 urine samples were collected from apparently healthy subjects who have not taken antibiotic therapy at least one month prior to the time of sample collection. The age of chosen ones ranged between 1 and 70 years. Thereafter, 27.2% of the volunteers were positive for significant bacteriuria. The most predominant pathogen isolated was *Escherichia coli* (66.18%) while other isolates include *Klebsiella pneumonia* (2.5%), *Staphylococcus aureus* (8.09%), *Proteus mirabilis* (6.62%), *Pseudomonas aeruginosa* (2.94%) and *Staphylococcus faecalis* (3.68%) of the total bacterial isolates. The occurrence of rate of causative organism differs significantly by both age and sex among the volunteers.**

**Key words:** Urinary tract infection, significant bacteriuria, pyuria.

## INTRODUCTION

Urinary tract infections (UTIs) are common and important health problems occurring in both sexes and age groups (Bass et al., 2003). Disorders linked to the genitourinary tracts are referred to as urinary tract infections, which may be caused by pathogenic bacteria, fungi, protozoa, or viruses. The organism responsible in each case cannot survive for long outside the host and requires direct contact with mucous membrane for transmission. Among the common infections are: soft sore granuloma, pyelonephrities, urethritis, vaginitis, prostatitis, etc. The sources of UTIs are multifarious and include semen, syphilitic sores, discharges and blood. These sources contain active organisms that can be passed on to other persons. Transmission occurs in four ways; namely through sexual intercourse, from mother to the foetus via placenta, through poor personal hygiene, and via communal sponge and towel usage.

At present, urinary tract infections rank highest in terms of reported cases among diseases. It affects all age groups of humans and both sexes in either symptomatic form (Nicolle, 2001; Foxman, 2002). It is the most common bacterial infection in elderly men and women. UTIs are among the most common illnesses of childhood affecting the entire age range of children (Riccabona and Fotter, 2004). In general, urinary tract infections account for 6% of reasons for a visit to a general medical practitioner (Beyer et al., 2001).

Uncomplicated urinary tract infection is only associated with bacterial infection and affects women more than men. It is also simply called asymptomatic bacteriuria and majorly occurs in people who are otherwise healthy, with normal urinary tract and can empty their bladder completely and conveniently on their own. This research was carried out to determine the prevalence of urinary pathogens associated with UTIs in apparently healthy individuals in Ile – Ife, Nigeria and their susceptibilities to commonly use antibiotics was examined.

## MATERIALS AND METHODS

### Study population

Urine samples were collected from apparently healthy individuals in Ile – Ife, Osun State, Nigeria between May and August 2007. Subjects in the study area were visited from house to house for the

*Corresponding author. E-mail: kunledoexploit@yahoo.com. Tel: +2348036115296.

**Table 1.** Occurrence of bacterial pathogens from collected urine samples.

| Bacterial isolates | Number of times isolated | % of isolates |
|---|---|---|
| *Escherichial coli* | 90 | 66.18 |
| *Klebsiella pneumonia* | 17 | 12.5 |
| *Staphylococcus aureus* | 11 | 8.09 |
| *Proteus mirabilis* | 9 | 6.62 |
| *Pseudomonas aeruginosa* | 4 | 2.94 |
| *Streptocuus feacalis* | 5 | 3.68 |
| Total | 136 | 100 |

purpose of enlightenment and sample collection to make them willing to donate their urine samples for this research.

**Collection of urine samples**

A sterile disposable universal bottle with a sticker on it was given to each volunteer. Only first voided mid stream morning urine samples were collected into the sterile disposable universal bottles provided (Hootom and Stamm, 1997). In all, 500 samples were collected for laboratory analysis. Samples were usually analyzed within 1 h of collection.

**Preparation of culture media**

A 28 g portion of dehydrated nutrient agar powder and 52 g Mac-Conkey agar powder were each dissolved in 1 litre of distilled water. Proper dissolution was ensured on a hot plate. Thereafter the mixtures were autoclaved at 121℃ for 15 min. The agar was allowed to cool to about 45℃ before pouring into sterile Petri dishes.

**Centrifugation of urine samples**

Five millilitres (5 ml) of each sample were aspirated into a sterile test tube and spinned in a centrifuge (Gallenkamp) at 2500 rpm for 5 min. Thereafter, the supernatant (suspended liquid without solid) was discarded leaving the main urine sample deposit at the base of the centrifuged tube.

**Urine microscopy**

Grease free slides were smeared with a drop of centrifuged urine sample deposit using a sterile inoculating loop. After covering with a cover slip, each of the prepared slides was then mounted on the microscope for examination under the x40 objective lens. The presence of white blood cell, red blood cell, cast, crystals, purge, nitrites, and enzymes (esterase) was analysed in accordance with Wilson and Junger (1968).

**Isolation and characterization of micro organisms**

For the purpose of bacterial culture, 0.002 ml of uncentrifuged portion of each urine sample was inoculated on nutrient agar and Mac Conkey agar media using a calibrated standard wire loop (Hooton and Stamm, 1997). The seeded agar plates were then incubated at 37℃ for 24 h. After 24 h, each plate was examined for colony count and etiological agent, which are the main criteria for defining true urinary tract infection by bacterial culture. Each urine sample culture yielding ocer$10^5$ organisms' millilitre of urine was considered significant bacterial growth for the diagnosis of true urinary tract infection. Different colonies present on the culture plate were isolated and subjected to further tests for bacterial identification. The results obtained were correlated with the degree of pyuria and a minimum of 8 whiter blood cells high per microscopic field was used to determine whether the isolated pathogen was clinically significant for true urinary tract infection according to Harvey (2002).

**Urine colony count**

After 24 h of incubation, each urine sample culture was critically observed for colony nature, structure colony and number. The colonies were counted by placing each culture plate on the electronic colony counter to determine significant bacteriuria. A colony count of $10^5$ or more organisms per millilitre of unspurned urine sample is termed positive or significant for asymptomatic bacteriuria.

## RESULTS

Out of the 500 samples analysed, 136 (27.2%) were significant for bacteriuria symptomatic urinary tract infection. The occurrence rate of pathogenic organisms was seen to differ significantly by age and sex among the volunteers. *E. coli* was the most frequently isolated pathogen with 66.18% occurrence rape followed by *Klebsiella pneumoniae* (12.50%), *S. aureus* (8.09%), *P. mirabilis* (6.62%), *P. aeruginosa* (2.94%) and *S. faecalis* (3.68%) (Table 1).

The antibiotic susceptibility test showed that the bacterial isolates varied in their resistance pattern to a number of antibiotics used in this study. Resistance to antibiotics was generally high; Tetracycline (100%), Erythromycin, Cotrimazole and Streptomycin (83.3%), Safamycin and Oxacillin (66.7%), while Ciprofloxacine, Amoxycillin, Chloramphenicol, Cephaloridue, Nitrofurantoin and Vancomycin showed 50% resistance respectively.

The distribution of significant bacteriuria among apparently healthy individual in relation to age and sex as shown by data obtained is expressed in Table 2.

Results obtained from the analysis of urine samples showed that the distribution of significant bacteriaurea

**Table 2.** Distribution of significant bacteriuria in relation to age and sex.

| Age group (years) | No. of Females examined | Total positive | % total positive | No of male examined | Total positive | % total positive | Total no examined | Total no positive | % total positive |
|---|---|---|---|---|---|---|---|---|---|
| 1 – 14 | 48 | 27 | 56.25 | 46 | 9 | 21.74 | 94 | 37 | 39.36 |
| 15 – 24 | 25 | 8 | 32 | 39 | 4 | 10.26 | 64 | 12 | 18.75 |
| 25 – 34 | 49 | 13 | 26.53 | 46 | 6 | 13.04 | 95 | 19 | 20 |
| 35 -44 | 36 | 14 | 38.9 | 70 | 4 | 5.71 | 106 | 18 | 16.98 |
| 45 -54 | 40 | 16 | 40 | 30 | 3 | 10 | 70 | 19 | 27.14 |
| 55- 64 | 16 | 7 | 43.75 | 20 | 8 | 40 | 36 | 15 | 41.61 |
| > 65 | 19 | 9 | 47.37 | 16 | 7 | 43.75 | 35 | 16 | 45.71 |
| | 233 | 94 | 41.20 | 267 | 42 | 14. 98 | 500 | 136 | 27.2 |

**Table 3.** Distribution of significant bacteriuria and pyuria in relation to age and sex.

| Age group (years) | Male examined positive | CFU/ML | Pyuria WBC/ Field | Female examined positive | Cfu/ml | Wbc / field Pyuria |
|---|---|---|---|---|---|---|
| 1 – 14 | 9 | 108 | 8 | 12 | 109 | 9 |
| 15 – 24 | 4 | 110 | 8 | 10 | 107.5 | 8 |
| 25 – 34 | 5 | 109.5 | 10 | 27 | 108 | 10 |
| 35 -44 | 4 | 114 | 11 | 31 | 112 | 12 |
| 45 -54 | 3 | 108.5 | 9 | 8 | 109.5 | 10 |
| 55- 64 | 8 | 112 | 8 | 5 | 111 | 8 |
| > 65 | 6 | 107.5 | 7 | 3 | 108 | 8 |

Cfu/ml: colony forming unit per millilitre; Wbc: White Blood cells.

and pyuria among apparently healthy individuals varied among age, the groups, and sexes (Table 3).

## DISCUSSION

Results obtained from this study showed that (27.2%) of total number of people examined prove positive for significant bacteriuria. Beuben et al. (2000) opined that the incidence of urinary tract infection in apparently healthy individual is real and should be given outmost attention. The incidence of urinary tract infection among apparently healthy individuals as seen from this result varies significantly between age groups and sexes. 18.8% (94) female out of total number of persons examined were positive for significant bacteriuria compared to 8.4% (42) male out of total number of examined people were positive for significant bacteriuria 94 (69.12%) of total number of positive were female as compared to 42 (30.88%) of total number of people that are male. This result is in agreement with the findings of (Jawetz et al., 1998; Nicolle, 2001) who reported that the 'incidence of urinary tract infection among apparently healthy individual is highest among female than that in men.

The distribution of urinary tract infection among males the age groups of 5 – 14 years and >55 has the highest incidence of 58.33 and 52.63% respectively. This result is in agreement with the findings of Foxman (2002) where he reported that urinary tract infection is most prevalent in the young male because of anatomical anomalities and intractable incontinences of the urinary tract infection in the adult respectively. One of the reasons for lower incidence in male than female is the antibacterial property of prostatic fluid. Among the female, the age group of 35 – 54 years was the mostly affected age group. Reasons for this according to Beyer et al. (2001) is that this age group constitute the most sexually active group with unhygienic, and uncontrolled sex life been the major cause of urinary tracts infection in the elderly. The reason for this was attributed to anatomically short urethra among female, favouring bacterial accent into the bladder. Infection in infant as seen from this result may be due to underdevelopment of the immune system. This result shows that *E. coli* is the most prevalently isolated pathogen with 66.18% of total bacterial isolates and therefore the most predominant cause of urinary tract infection among apparent healthy individual. This also is in line with the findings of (Jawetz et al., 1998; Foxman, 2002). The incidence of UTIs caused by more than one pathogenic agent was seen in this research work.

*E. coli* and *Klebsiella pneumoniae* infected 1.47% of

**Table 4.** Percentage of bacterial isolates.

| Bacterial isolates | Male | % Isolates of specific bacterial | Female | % isolates | Sum total | % sum total |
|---|---|---|---|---|---|---|
| *Escherichia coli* | 20 | 22.22 | 70 | 77.79 | 90 | 66.18 |
| *Klebsiella pneumoniae* | 7 | 41.18 | 10 | 58.82 | 17 | 12.50 |
| *Staphylococcus aureus* | 4 | 36.36 | 7 | 63.64 | 11 | 8.09 |
| *Proteus mirabilis* | 8 | 88.89 | 1 | 11.11 | 9 | 6.62 |
| *Pseudomonas aeruginosa* | 1 | 25 | 3 | 75 | 4 | 2.94 |
| *Streptococcus feacalis* | 2 | 40 | 3 | 60 | 5 | 3.68 |
| Total | 42 | 30.88 | 94 | 69.12 | 136 | 27.2 |

total number of positive individuals. This involvement of two or more bacterial organism as causes for urinary tract infection as seen from this result is established by Beuben (2000) and Nicolle (2001). Result of bacterial isolate show that *K. pneumoniae* is the second most prevalent isolate pathogen causing urinary tract infection and *P. aeruginosa* is the least cause of urinary tract infection. This is also confirmed by the findings of Jawetz et al. (1998).

It is significant to note from these results that 88.9% of *P. mirabilis* was isolated from males, while 11.1% of total *P. mirabilis* was isolated from females. Reason for this may be due to the anatomical nature of the male urinary tract and partially due to the ability of the bacteria to move by the aid of the flagellum. This observation was also reported by Jawetz et al. (1998).

The incidence of urinary tract infection among children and infants was confirmed by the result of this research work (Table 2) 27.21% of total numbers of positive individuals were from the age group 1 – 14 years. This result may be worrisome and show that paediatrics' UTIs may be prevalent within the study population and poses a threat to the health of the potential leaders of tomorrow.

Susceptibility of urinary pathogens is only one of the factors that influence antibiotics of choice, which makes its determination very important (Ladhani and Gransden, 2003). The *in-vitro* sensitivity patterns revealed that most of the antibiotics tested in this study might not be adequate in the treatment of UTIs in the study area due to the high resistance profile shown, in particular Tetracycline (100%), Erythromycin, Cotrimazole and Streptomycin (83.3%), Safamycin and Oxacillin (66.7%), which suggests that this antibiotics will be of little or no use in treating the bacterial isolates in the study area. This finding supports earlier reports of heavy use of antibiotics (Weber et al., 2005; Esan et al., 2006). High prevalence of multiple antibiotic resistances was showed in this study. This phenomenon has been attributed to indiscriminate use of drug, self medication, sub-optimal quality of antimicrobial drugs among others (Watson et al., 2001; Esan et al., 2006).

In the light of the result of this research, it is highly recommended that public enlightenment and education should be carried out as to how to maintain good personal hygiene especially among women and young girls. Apparently healthy individual in relation to age and sex as shown by data obtained is expressed in Table 2.

Results obtained from the analysis of urine samples showed that the distribution of significant bacteriuria and pyuria among apparently healthy individuals varies among age, the group and sexes (Table 3). Table 4 shows the summary of the overall percentage bacterial isolate per sex.

Results obtained from biochemical identification and confirmation of bacterial isolates from urine sample of apparently healthy individuals is stipulated in Table 4.

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