PREVALENCE OF BACTERIAL AND PARASITIC URINARY TRACT INFECTIONS IN FEMALE STUDENTS OF IMO STATE UNIVERSITY

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ABSTRACT

The prevalence of urinary tract infections (UTIs) was evaluated in three hundred female students of Imo State University, Owerri using urinalysis, direct microscopy and culture methods. 84 cases of significant bacteriuria indicating a prevalence of 28%, 13 (4.3%) Trichomonas vaginalis and 2 (0.7%) Schistosoma haematobium was observed. The most common organisms were Escherichia coli (32.1%) and Klebsiella spp (22.6%). Others were Staphylococcus aureus (16.7%), Pseudomonas spp (14.3%) Coagulase negative Staphylococcus (10.7%), Proteus mirabilis (8.3%) and Serratia marcesens (2.4%). The in vitro-antibiotic susceptibility of isolates to Ampicillin, Chloramphenicol, Erythromycin, Tetracycline and Streptomycin multi-discs using agar diffusion method showed all the isolates to be less than 50% sensitive to Ampicillin (2µg). The findings could be related to multi-ethnic attributes of those examined, persistence of poor sanitary conditions and sexual habits. It is recommended that seminars, routine and regular mass screening on asymptomatic UTI be carried out since untreated UTI may lead to Pyelonephritis and kidney failure.

KEYWORDS: Trichomonas vaginalis, Schistosoma haematobium and Serratia marcesens.
INTRODUCTION
Urinary tract infections (UTIs) constitute serious health problem affecting millions of people each year and rank high among the common hospital acquired infections (Tapsal et al., 1975). It indudes diseases that affect kidneys, (pyelonephritis), urethra (urethritis) and urinary bladder (cystitis) (Kunin, 1974). The "Urinary tract” consists of the various organs of the body reduce, store and excrete urine. The kidneys remove excess and wastes from the blood in the form of urine; narrow tubes Ureters carry urine from the kidneys to the bladder. Urine is in the bladder and emptied through the urethra. Normal urine sterile, it contains fluids, salts and waste products, but it is free 'torn bacteria, viruses and fungi (NIH, 2003).

UTI can occur in male and females of any age, with bacterial counts as low as 100 colony-forming units (CPU) per millimeter in urine (Akinyemi et al., 1997), especially in patients with symptoms of acute urethral syndrome, males with chronic prostatitis and patients with indwelling catheters (Karen et al., 1994).

PATHOGENICITY OF UTIs
UTIs are the leading cause of Gram-negative bacteraemia in patients of all ages, and are associated with a high risk of morbidity and mortality, especially in the elderly (Orenstein and Wong, 1999). Complicated UTIs may occur in men, children and pregnant women, but it is especially common in the elderly as well as in immunocompromised patients and in individual with neurologic disorders.

The urinary tract can be infected by bacteria entering the kidneys from the blood stream and traveling downward (haematogenous route) or by bacteria entering the urethra and traveling upward (ascending route). This spread is encouraged by faecal incontinence in infants and possibly poor personal hygienic habits in adults especially as infecting organisms are most commonly derived from the patients' own faecal flora (Grunbery et al., 1960) as cited by Kass (1978) and Schaeffer (1987).

In small children still using diapers, stool can sit for some time right at the meatus (outside opening). The longer it sits there, the more likely it is that bacteria may enter the urethra. This is more likely in females since the female urethra is shorter and the anatomical relationship of the female urethra to the vagina makes it liable to trauma during sexual intercourse as well as bacteria being massaged up the urethra into the bladder during pregnancy/childbirth (Duerden et al., 1990; Kumarand, 1992). Older females may become prone to UTIs through wiping
back to front when they are first toilet trained which pulls stool into the vaginal/meatal area. Usually, the body keeps bacteria out of the urine firstly, when the urethral sphincter is squeezed shut and microorganisms cannot move up the urethra from the meatus into the bladder. Secondly, the length of the urethra in males (which is longer than in females) makes it less likely for men to have UTI. Thirdly, frequent washing of the urethra during urination prevents easy settlement of microorganisms. Finally, the valves at the point where the urethras enter the bladder prevent urine from refluxing from the bladder to the kidney, so if the urine in the bladder is infected, the infected urine will not travel up to the kidneys.

In infancy, and early childhood, bacteriuria with or without symptoms may lead to the development of renal scarring and vesico-ureteric reflux (Ahmed, 1998). Also persistent UTI in children often leads to chronic pyelonephritis and renal failure (Mears and Stamey, 1963 as cited by Winberg, 1982). In elderly women, the infection is associated with bladder dysfunction, cystocele formation and uterine prolapse (Dontas et al, 1981).

The Merck Manual (1998) reported, that in parasitic diseases, visceral leishmaniaiasis might cause clinical nephropathy manifested by microscopic hematuria and minor proteinuria. Consequently, renal biopsy reveals glomerula disease with increased mesangial cells, matrix and electron-dense deposits. In addition, Quartan malaria nephropathy (caused by Plasmodium malariae) occurs predominantly in children and younger adults. It typically presents with the nephrotic syndrome. Plasmodium falciparum infection, the most frequent renal manifestation (in about 1% of patients) is acute renal failure associated with acute tubular necrosis due to intravascular haemolysis or heavy parasitaemia. Further more, schistosomiasis causes urinary lesions involving the bladder, lower ureters and ureteral obstruction is the most common urologic problem which when severe is associated with obstructive nephropathy. Finally, filariasis, which involves obstruction of lymphatic system, leads to chyluria and membranous proliferative form of glomerulonephritis.

DIAGNOSIS

The most common screening tests for UTI include urine dipstick and microscopic urinalysis, with a combination of leukocyte esterase (LE) and nitrate testing achieving sensitivities of 78% to 92% and specificities of 65% to 98% (Winberg, 1992; Shaw et al., 1998). The author of a recent study (Shaw et al., 1998) using enhanced urinalysis recommend a urine dipstick as a reliable and economic screening test. In their view, enhanced urinalysis should be reserved for use in neonates (infants <8 weeks of age) and in patients with comorbid conditions,
including underlying anatomic renal abnormalities. Urine culture remains the definitive test for confirming the diagnosis of UTI (Kelly and Shortliffe, 1999; American Academic of Pediatrics, 1999).

According to Chikwem (1996), the most reliable and routinely used method for the diagnosis of UTI is a semi-quantitative cultural technique by which the numbers of bacteria are enumerated. A UTI is only considered definite if there is both >100 white cells and >105 pure growth. Many workers have reported that 30-50% of women with acute infection of the lower urinary tract characterized by frequency of urination, dysuria and urgency, thirty to fifty percent will have counts less than 105 organism /and even when specimens have been obtained by suprapubic aspiration of the bladder (Tapsall et al; 1975; O’ Grady et al; 1977; Kraft and stamey 1977). Stamm et al (1982) therefore suggested that a low count of coliform bacteria (> 100 organism/ml) should always be considered significant in women with symptoms particularly when there is pyuria. Any bacterial growth from specimens obtained by ureteric catheterization, renal biopsy, suprapubic aspiration and post prostatic massage should be considered significant (Stamey, 1980; Mears et al; stamm et al., 1982). Infections associated with the urethra, parauretral glands and idney maybe polymicrobial and include anaerobic or fastidious organisms (Smith & Easman, 1990).

Radiographic advances (such as imaging and ultrasound) are used firstly, to identify the presence of parenchymal damage at the time of diagnosis. Sequentially to identify the presence of underlying functional or anatomic abnormalities that predisposes the patient to UTIs or renal damage. Thirdly, to provide a baseline for comparisons (Andrich and Majd, 1992; Pennington and zein, 1999). As a rule, a renal ultrasound is the first step for identifying parenchyma! disease or signs of obstructive uropathy such as a hydroureter or hydro nephrosis in infants, children with suspected pyelonephritis and children with a known immunodeficiency or suspected anatomic abnormality (Andrich and Majd, 1992; Kelly and Shortliffe, 1999; Shaw and Gorelick, 1999).

A voiding cystourethrogram (VCUG) is excellent for identifying vesico-ureteral reflux, the most common abnormality associated with UTI in infants, this condition is present in more than 50% of infants younger than 1 year of age (Orenstein and Wong, 1999). Patients with fever for longer than 48 to 72 hours despite antibiotic treatment and with signs of systematic toxicity or bacteriuria should be suspected of having a complicated infection with renal or perirenal abscess, anatomic obstruction or nephrolithiasis (Wood, 1998).
OBJECTIVE OF THE STUDY
Asymptomatic UTI has been shown to progress to a variety of renal diseases ranging from urethritis to pyelonephritis. Before UTI can be treated, it is imperative that the cause of infection is determined. The main objective of this research study is as follows;
1. To determine the prevalence of bacterial and parasitic UTI among the female students of Imo State university.
2. To determine the most common bacterial and parasitic aetiologic agent of UTI.
3. To determine the prevalence of significant mixed bacterial and parasite infection. This will help in the choice of antimicrobial nor antiparasiti drugs.

RESULTS
Of the 300 urine specimens examined in this study, 84 (28%) had significant (> 105 cfu/ml), 107 (62.3%) had insignificant (<105 cfu/ml) and 29 (9.7%) had no growth at all. This is shown in table 1. Significant pyuria was detected in 74 (24.7%) samples out of which 64 (86.5%) had significant bacterial growth and 10 (13.5%) had no significant growth. 2 (33.3%) out of 6 (2.0%) samples with lood had ova of S. haematobium, they also tested positive for protein. Of the 103 (34.3%) sample that tested positive for protein, 78 (5.7%) had significant growth, 6 (5.8%) had insignificant growth and 3 (4.3%) had trophozoites of T. vaginalis. This is clearly shown in able 2.

Table 3, shows the types of isolates recovered from the mples. The predominant isolate was E.coli 27 (32.1%) followed by Klebsiella spp 19 (22.6%), S.aureus 14 (16.7%), Pseudomonas spp 2 (14.3%), S.saprophyticus 9 (10.7%), Proteus mirabilis 7 (8.3%), Streptococcus spp 3 (3.6%) and Serratia marcesens (2.4%). 3 specimens yielded significant mixed growth out of which S. aureus and S. saprophyticus accounted for (33.3%) while P.mirabilis and E.coli accounted for (66.7%).

From the age distribution of the bacteriuric students summarized Table 4, age range 23-27 years had the highest number 172 (57%) samples and the highest number 56 (66.7%) of significant bacteriuria. This was followed by age range 18-22 years 36(42.9%).

T. Vaginalis was found in female students within the age range 18-32 with the age range 23-27 having the highest 7 (53.8%) prevalence.

The invtro antibiotic sensitivity pattern of the isolates to common anti-microbial agents is
shown in Table 5. The result shows that the organisms were not readily susceptible to the antibiotics used in this study, Pseudomonas spp was found to be resistant to all antimicrobial drugs used in this study. All the organisms responded poorly to Ampicillin (2^ig). Although this study is limited to the incidence of bacterial and parasitic UTI, It is necessary to mention that Candida albicans was the fungi commonly detected 36 (12%).

Table 1. DISTRIBUTION OF URINE SAMPLES ACCORDING TO LEVEL OF BACTERIAL GROWTH.

<table>
<thead>
<tr>
<th>Significant bacterial growth ≥105cfu/ml</th>
<th>Insignificant bacterial growth &lt;105</th>
<th>Absence of bacterial Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 (28.0%)</td>
<td>187(62.3%)</td>
<td>29 (9.7%)</td>
</tr>
</tbody>
</table>

Table 2. Distribution Of Urine Samples According To Prevalence Of Blood, Pyuria And Proteinuria.

<table>
<thead>
<tr>
<th>Disorders</th>
<th>Significant Bacterial</th>
<th>Insignificant or No growth</th>
<th>S.haematobium</th>
<th>T. Vaginalis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyuria. n= 74</td>
<td>64</td>
<td>10(13.5%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(24.7%)</td>
<td>(86.5%)</td>
<td>6(100%)</td>
<td>2(33.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Blood n=6(2.0%)</td>
<td>-</td>
<td>6(100%)</td>
<td>2(33.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Protein n=103</td>
<td>(75.7%)</td>
<td>6 (5.8%)</td>
<td>2(1.9%)</td>
<td>7 (6.8%)</td>
</tr>
<tr>
<td>(34.3%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. DISTRIBUTION OF ISOLATES RECOVERED FROM SAMPLES.

<table>
<thead>
<tr>
<th>GRAM NEGATIVE</th>
<th>Number Positive</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eschehchia coll</td>
<td>27</td>
<td>32.1</td>
</tr>
<tr>
<td>Klebsiella spp</td>
<td>19</td>
<td>22.6</td>
</tr>
<tr>
<td>Pseudomonas spp</td>
<td>12</td>
<td>43.3</td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>7</td>
<td>8.3</td>
</tr>
<tr>
<td>Serratia marcesens</td>
<td>2</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Table 4. Distribution Of Isolates Recovered From Samples.

<table>
<thead>
<tr>
<th>GRAM POSITIVE</th>
<th>Number Positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>14</td>
<td>16.7</td>
</tr>
<tr>
<td><em>Streptococcus spp</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coagulase negative</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td><em>Staphylococcus spp</em></td>
<td></td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4. Age distribution of students with significant Growth & parasites.

<table>
<thead>
<tr>
<th>NO OF</th>
<th>AGE RANGE</th>
<th>E.COLI</th>
<th>Klebsiella species</th>
<th>S.aureus</th>
<th>Pseudomonas</th>
<th>Coagulase negative Staphylococci</th>
<th>P.mirabilis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$&gt;$ 18</td>
<td>$&lt;$ 22</td>
<td>11(34.4%)</td>
<td>5(26.3%)</td>
<td>4(33.3%)</td>
<td>4(41.7%)</td>
<td>2(28.6%)</td>
</tr>
<tr>
<td>11</td>
<td>23-27</td>
<td>15(46.9%)</td>
<td>12(63.2%)</td>
<td>8(66.7%)</td>
<td>6(50%)</td>
<td></td>
<td>3(42.9%)</td>
</tr>
<tr>
<td>17</td>
<td>28-32</td>
<td>1(3.1%)</td>
<td>2(10.5%)</td>
<td>-</td>
<td>1(8.3%)</td>
<td></td>
<td>2(28.6%)</td>
</tr>
<tr>
<td>7</td>
<td>33 - 37</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1(11.1%)</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>27(32.1%)</td>
<td>9(22.6%)</td>
<td>14(16.7%)</td>
<td>12(14.3%)</td>
<td>9(10.7%)</td>
<td>7(8.3%)</td>
</tr>
</tbody>
</table>

P. mirabilis | Streptococcus Spp | S.marcescens | S. haematobium | T. vaginalis  
2 (28.6%) | - | 2(100%) | 1(50%) | 4(30.8%)  |
3(42.9%) | 3 (100) | - | 1(50%) | 7(53.8%)  |
2(28.6%) | - | - | - | 2(15.4%)  |
- | - | - | - | -  |
7(8.3%) | 3 (3.8%) | 2(2.4%) | 2(0.7%) | 13(4.3%)  

Staphylococcus epidermidis and Staphylococcus saprophyticus both coagulase negative could not be differentiated due to insufficient.

Table 7. Percentage Distribution Of Antimicrobial Susceptibility Of Isolate. %

<table>
<thead>
<tr>
<th>ISOLATE</th>
<th>ERY</th>
<th>CHL</th>
<th>AMP</th>
<th>S</th>
<th>TET</th>
</tr>
</thead>
<tbody>
<tr>
<td>E coli</td>
<td>22.2</td>
<td>11.1</td>
<td>22.2</td>
<td>33.3</td>
<td>40.7</td>
</tr>
<tr>
<td>Klebsiella spp</td>
<td>-</td>
<td>21.0</td>
<td>-</td>
<td>31.6</td>
<td>42.1</td>
</tr>
<tr>
<td>S.aureus</td>
<td>81.2</td>
<td>64.3</td>
<td>-</td>
<td>92.9</td>
<td>85.7</td>
</tr>
<tr>
<td>Pseudomonas</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>P.mirabilis</td>
<td>-</td>
<td>85.7</td>
<td>-</td>
<td>57.1</td>
<td>42.9</td>
</tr>
<tr>
<td>Streptococcus</td>
<td>100</td>
<td>-</td>
<td>33.3</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Spp.</td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Serratia</td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>S.marcescens</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Coagulase</td>
<td>77.8</td>
<td>100</td>
<td>44.4</td>
<td>88.9</td>
<td>88.9</td>
</tr>
<tr>
<td>negative</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Staphylococci</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

ERY - Erythromycin; CHL - Chloramphenicol; AMP - Ampicillin; S - Streptomycin; TET - Tetracycline.
FOOTNOTE
1. The size of the antibiotic disc was measured and found to be 9mm.
2. A zone of inhibition of 2.5mm and above is regarded as sensitive.
3. Designates absence of zone of inhibition

DISCUSSION
The prevalence of UTIs in this population was 28%. This figure is lower than the prevalence rate of 35.3% significant bacterial recorded by Ebie et al. (2001) in Nigeria Military Hospital and that recorded (38.6%) by Akinyemi et al. (1997). It is higher than the prevalence rate of 22% significant bacteriuria recorded by Ekweozor and Onyemenam (1996) in Ibadan. But agrees with the 25.65% by Nedolisa (1998) at the Jos University Teaching Hospital JUTH. This high prevalence collaborates with the report of Stamey and Pfau (1970) and Pfau et al (1983) that the prevalence of bacteriuria in females has been found to increase with sexual activity.

The most common organisms isolated in these students were E. coli. (32.1%); Klebsiella spp (22.6%), S. aureus (16.7%), Pseudomonas spp (14.35), S. saprophyticus (10.7%), Proteus mirabilis (8.3%). This finding is similar to other reports, which indicate that Gram negative bacteria particularly E.coli is the commonest pathogen isolated in asymptomatic UTI (Burbige et al., 1984; Akinyemi et al. 1997; Okonofua et al., 1989; Ebie et al., 2001 and Uwaezuoke et al, 2003). The high prevalence (22.6%) of Klebsiella species agrees with reports which state that these organisms are achieving more prominence as aetiologic agents of UTI than previously demonstrated (Obaseki Ebor, 1988; Abdurrahman et al., 1992; Adeyemo et al., 1994; Ebie et al., 2001). Coagulase negative Staphylococci (S. saprophyticus) have been shown to be of importance as pathogens in the urinary tract.

Maskell (1974) suggested that the infection and sexual intercourse are probably related. Olusanya et al. (1992) also found a high incidence of 28.9% cases of coagulase in negative Staphylococcus in 38 women with asymptomatic bacteriuria.

Certain factors such as increase in promiscuity, facilities for travel and easy availability of birth control method amongst others have been documented as accounting for the high incidence of T. vaginalis (Hoosen, 1987). Incidence of 4.3% was recorded in this study. However, studies in women have documented a high prevalence of up to 50% in both symptomatic and asymptomatic cases (Hoosen, 1987; O'farret, 1989).
According to Cowper (1963), Imo State belongs to the areas classified as having moderate S.haematobium transmission. However, the overall prevalence of 0.7% prevalence observed in this study is lower than the figures reported by Oldenburg (1942) in Owerri (30%) which is in conformity with what obtains in much of the rainforest zones of South Eastern Nigeria (Udonsi, 1990; Nduka, et al., 1995; Anosike et al., 1998). It is also lower than that reported by Okoli (2002) in Owerri West (10.4%). This low prevalence may be due to the fact that Imo State University is an anchor point of females from different parts of the country having different prevalence rates for S.haematobium infection. More so, the female students spend more time in school and hardly wade or swim in streams.

Significant pyuria was detected in 74 (24.7%) out of which 10(13.5%) had sterile pyuria, which could be as a result of either renal tuberculosis, gonococcal urethritis, leptospirosis or anti microbial therapy (Cheesbrough, 1984). 103 (34.3%) had proteinuria but only 6 (5.8%) had no visible parasite or significant bacterial growth. This could be attributed to other ailments (rather than UTI) which produce protein in urine, as a result of aorthostatic proteinuria which is a normal physiological response for some people who move around a lbt.(Andriole, 1985).

The antibiotic sensitivity of the isolates showed that Amipicillin was poorly effective against majority of the organisms isolated in this study. This agrees with findings of Ebie at aj (2001) in Nigerian Military Hospital Jos. But differs from findings in Caucasian women where Ampicillin is one of the most useful antimicrobial agents (Ronald, 1987). However, the difference may be due to time difference between the two studies or practices of self medication and indiscriminate use of Ampicillin in Nigeria which led to the emergence of bacterial strains that are resistant to these relatively safe antibiotics (AkinyemieJ: aj, 1997).

The susceptibility patterns suggest that it is absolutely necessary to obtain sensitivity reports before initiation of antibiotic therapy in cases of suspected UTI.

This study is far from perfect as errors might have arisen from various sources. With a few exceptions, student by ignorance, failed to corporate with information and whenever samples are required to be repeated in order to ensure precision or to clarify doubtful results. Such circumstances might have influenced the precision of this study.

However, it was observed that the result of this study agrees with. some aspects with the
literature that has been accumulated on the subject of UTI.

RECOMMENDATIONS

1. 28% and 5% prevalence rates of asymptomatic bacteriuria and parasitic UTI respectively observed in this present study underscores the importance of routine and regular mass screening for asymptomatic UTI be carried out since untreated cases may lead to pylonephritis, renal scaring and even kidney failure.
2. The state government should be made aware of the poor sanitary conditions of most hostels which tends to increase the transmission of this infections. Therefore facilitate the construction of better hostel accommodations.
3. Seminars should be organized in the school from time to time, to educate the students on how to prevent UTIs.

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