PREVALENCE OF URINARY TRACT INFECTION (UTI) AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN AMONG PATIENTS ATTENDING NATIONAL HOSPITAL ABUJA, FCT - NIGERIA

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SUMMARY

INTRODUCTION

Urinary Tract Infection (UTI) is a significant health problem worldwide, affecting all ages and both sexes. Hence, the need for determination of microorganisms causing urinary tract infection (UTI) and their in-vitro susceptibility test is of paramount important to improve service delivery to patients. With this background, a retrospective study was carried out from July 2013 to December 2013 at National Hospital Abuja (NHA).

OBJECTIVE

This study is planned to determine the prevalence of urinary tract infection (UTI) among different sexes and age groups as well as the predominant bacterial pathogens and their sensitivity to antibiotics so as to guide empirical antibiotic therapy. This is aimed at providing improved patient care and management.

MATERIALS AND METHODS

A total of 2640 urine samples from patients attending both inpatient and Outpatient departments of NHA were included in this study. Data of all patients who had positive urine culture between July 2013 and December 2013 were systematically and retrospectively collected from the Laboratory register of the Medical Microbiology and Parasitology Department. Demographic data of these selected individuals' patient, sex, marital status, pathogens isolated and their antimicrobial sensitivity pattern were collated and analyse. These urine samples were earlier subjected to culture and sensitivity test with the use of standard bacteriological techniques as described by American Society for Microbiology (ASM).

RESULTS

Twenty five percent of the total urine samples (2640) showed significant bacterial growth. Ten different bacterial species were isolated. Among these, *Escherichia coli* (49.5%) was significantly the most predominant one (P<0.05) followed by *Staphylococcus aureus* (14.9%), *Klebsiella* spp (11.8%), *Enterococcus faecalis* (8.9%), *Pseudomonas aeruginosa* (4.4%), *Proteus spp* (3.3%) and others. Majority of Gram-negative bacteria showed susceptibility towards Ciprofloxacin, Gentamicin, and Amikacin. The age group with highest frequency of UTIs was 21–30 years with females predominating in all the age groups except in less than 1 and above 60 years (Fig. 7). The results showed that married women are more likely to be affected than their single or widowed counterparts while the reverse was the case in males (Fig. 8).

CONCLUSION

This outcome of this study shows that there is need for more work in this area be to consistently determine the changing pattern of microbial uropathogens and their antimicrobial profiles.

INTRODUCTION

UTI is the one of the most common infectious presentation in community practice. Urinary tract infection (UTI) is the infection of the urinary tract, which is viewed as a single anatomical unit that is united by a continuous column of urine extending from the urethra to the kidney[1]. UTI encompasses a wide variety of clinical entities whose common denominator is the microbial invasion of any tissue of the tract from the renal cortex to the urethral meatus. Infection of prostate and epididymis is also included in the definition[2].

UTI has different names, depending on what part of the urinary tract is infected. An infection in the bladder is called *Cystitis* or bladder infection and it is the commonest of the urinary tract infections. If the infection is on the kidney, it is called *Pyelonephritis and* urethritis for infection in the urethra[3].

Urinary tract infections are caused by bacteria that enter the urethra and then the bladder. This can lead to infection, most commonly in the bladder, which may spread to the kidney[5]. Sexual activities, gender, urinary catheters, genetics, diabetes, sickle cell disease, enlarged prostate, narrowed urethra, kidney stone and pregnancy includes the risk factors of urinary tract infections[4][5][6].

UTIs encompass a spectrum of clinical entities ranging in severity from asymptomatic infection to acute cystitis, prostatitis, pyelonephritis and urithritis[7], [8]. It represents one of the most common diseases encountered in medical practice today, affecting people of all ages, from the neonate to the geriatric age group[9].

Worldwide, about 150 million people are diagnosed each year with UTIs, costing in excess of 6 billion dollars[10]. The structure of the females urethra and vagina makes it susceptible to trauma during sexual intercourse as well as bacteria been massaged up the urethra and into the bladder during pregnancy and or child birth[11, 12].

The aetiological agent and their susceptibility patterns of UTIs vary in regional and geographical location[13]. Besides, the aetiology and drug resistance change through time[14]. Knowledge of the local bacterial aetiology and susceptibility patterns is required to trace any change that might have occurred in time so that updated recommendation for optimal empirical therapy of UTI can be made[15].

In Nigeria, a number of studies have been done on the prevalence and antimicrobial resistance patterns of UTIs[16, 17, 18]. However, no data have been reported from the present study area, hence the study was designed to identify and determine the prevalence of the bacteria associated with UTI among different sexes, age groups in Abuja and its environs, and to investigate the sensitivity of isolated bacteria to various antibiotics for effective treatment.

Today, antimicrobial drugs remain the front line therapy for conquering bacterial infection[19]. For the successful treatment, culture and sensitivity test is essential which is lacking in many parts of Nigeria.

Early detection and eradication of bacteriuria is very important for prevention of recurrence and complication e.g. chronic pyelonephritis, chronic renal failure etc. The objective of the study was to highlight different bacterial species causing UTI and their antimicrobial susceptibility profile among patients attending NHA.

METHODOLOGY

STUDY AREA

The National Hospital Abuja is a 280-bed tertiary hospital, located in the Central Business District of the Federal Capital Territory, with state-of-the-art facilities for both clinical and Laboratory components. It used to serve as the final tertiary health care referral centre for the country until recently when some selected teaching hospitals were upgraded to its level in terms of equipment. The Medical Microbiology and Parasitology department of the NHA received average of 30 urine samples per day from both inpatients and outpatients.

STUDY POPULATION AND DURATION

A total of 2640 urine specimens collected from July 2013 to December 2013 of suspected UTI patients (both outpatient and inpatient) were retrospectively studied in National Hospital Abuja. Specimen collection, culture, identification and antimicrobial susceptibility test were done

according to the guidelines given by American Society for Microbiology.[20] Chi-square (X2) test was done wherever applicable with a P value <0.05 regarded as significant.

RESULTS

Table1: Pattern of culture results (n=2640)

Samples Growth Pattern	No of Samples	Percentage
No Significant growth	1980	75%
Significant growth	660	25%
Total	2640	100%

Table 1 highlight that only 25% (660) of urine specimens showed significant bacterial growth while the rest shows no significant growth.

Table 2: Pattern of all bacterial Isolates (n=660)

S/N	Isolates	Total	Percentage
1	*Escherichia coli*	327	49.5
2	*Staphylococcus aureus*	98	14.9
3	*Klebsiella* spp	77	11.8
4	*Enterococcus faecalis*	59	8.9
5	*Pseudomonas aeruginosa*	29	4.4
6	*Proteus spp*	22	3.3
7	*Morganella morganii*	16	2.4
8	*Citrobacter* spp	13	2
9	*Staphylococcus saprophyticus*	10	1.5
10	*Providencia* spp	8	1.2
	Total	660	100

Table 2 Shows that *Escherichia coli* (49.5%) was significantly the most predominant one (P<0.05) followed by *Staphylococcus aureus* (14.9%), *Klebsiella* spp (11.8%). *Enterococcus faecalis* and *Pseudomonas aeruginosa* were less than 10%. Other bacterial isolates were around 3% or less.

Table 3: All Gram Positive versus Gram Negative bacterial Isolates (n=660)

Gram Type	Total	Percentage
Gram Negative Bacterial Isolates	493	74.7
Gram Positive Bacterial Isolates	167	25.3
Total	660	100

Table 3 shows that among the total bacterial isolates, significantly majority (74.7%) were Gram-negative bacteria (P<0.05).

Table 4: Pattern of Gram negative bacterial Isolates (n=493)

S/N	Isolates	Total	Percentage
1	*Escherichia coli*	327	66.3
2	*Klebsiella* spp	77	15.6
3	*Pseudomonas aeruginosa*	29	5.9
4	*Proteus* spp	22	4.5
5	*Morganella morganii*	16	3.3
6	*Citrobacter* spp	13	2.6
7	*Providencia* spp	8	1.6
	Total	493	100

Table 4 shows that among Gram-negative bacteria, *Escherichia coli* (66.3) was significantly predominant one (P<0.05) followed by *Klebsiella* spp (15.6%), *Pseudomonas aeruginosa* (5.9%) etc.

Table 5: Pattern of Gram Positive bacterial Isolates (n=167)

S/N	Isolates	Total	Percentage
1	*Staphylococcus aureus*	98	58.7
2	*Enterococcus faecalis*	59	35.3
3	*Staphylococcus saprophyticus*	10	6
	Total	167	100

Table 5 shows that among Gram-positive bacteria, *Staphylococcus aureus* (58.7%) was significantly predominant one (P<0.05) followed by *Enterococcus faecalis* (35.3%).
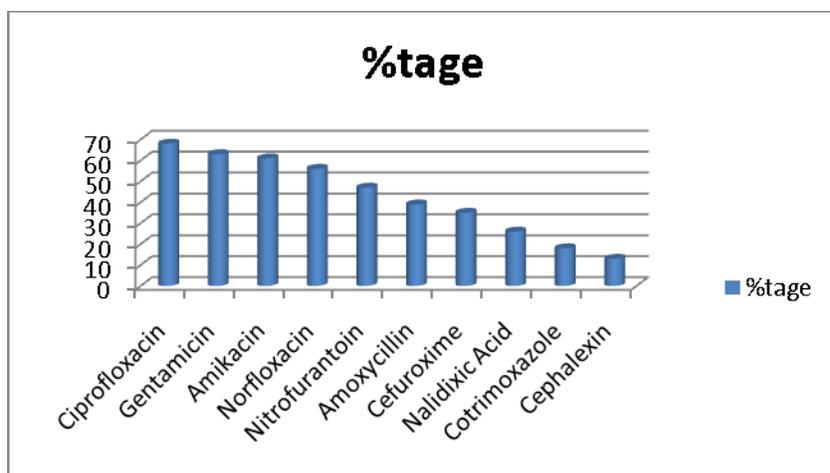
Figure 1: Antimicrobial drug Susceptibility for Gram negative bacteria (n=493)

Figure 1 shows that majority of Gram-negative bacteria showed susceptibility towards Ciprofloxacin (68%) followed by Gentamicin (63%), Amikacin (61%) and Norfloxacin (56%). Cephalexin (13%) was found least effective drug followed by Cotrimoxazole (18%). Nitrofurantoin, Amoxycillin, Cefuroxime, and Nalidixic Acid were effective only for less than half of Gram-negative bacteria isolated during this study.
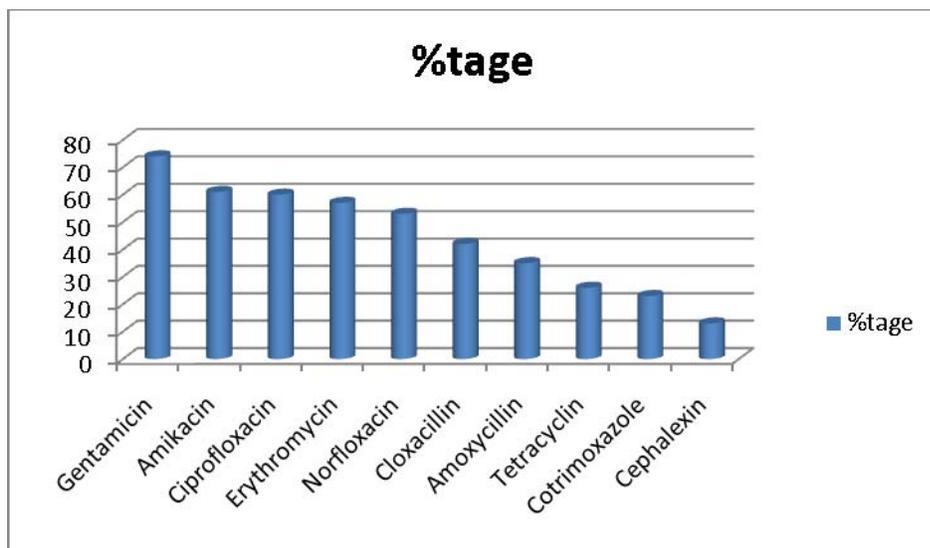
Figure 2: Antimicrobial drugs susceptibility of Gram positive bacteria (n=167)

Figure 2 shows that majority of Gram-positive bacteria showed susceptibility towards Gentamicin (74%) followed by Amikacin (61%), Ciprofloxacin (60%), Erythromycin (57%) and Norfloxacin (53%). Cephalexin (14%) was found least effective drug. Cloxacillin. Amoxycillin, Tetracyclin and Cotrimoxazole were found effective only for less than half of the Gram-positive bacteria isolates.

Table 6: Prevalence of UTI per Age and Sex Distribution

S/N	Age Range	Male	Female	Male %	Female %	Total	Total Percentage
1	< 1	22	14	3.3	2.2	36	5.5
2	1 - 10,	29	44	4.4	6.7	73	11.1
3	11 - 20,	23	29	3.5	4.4	52	7.9
4	21 - 30,	71	112	10.8	16.9	183	27.7
5	31 - 40,	38	69	5.8	10.4	107	16.2
6	41 - 50,	31	47	4.7	7.1	78	11.8
7	51 - 60,	9	7	1.4	1	16	2.4
8	> 60	64	51	10.7	7.7	115	17.4

Table 7 showed that adults of 21 – 30 years had the highest percentage (27.7%) occurrence of UTI in this study and females predominate in all ages with exception of the extreme end of the ages (< 1 and > 60 years).

Table 7: Percentages of UTI per Marital Status in Patients (n=660)

Marital status	Male	Female	Total Isolates	Male (%)	Female (%)	Total (%)
Single	73	52	125	11.1	7.9	18.9
Married	172	291	462	26.1	44.1	70
Others	23	50	73	3.5	7.6	11.1
Total	256	393	660	40.5	59.5	100
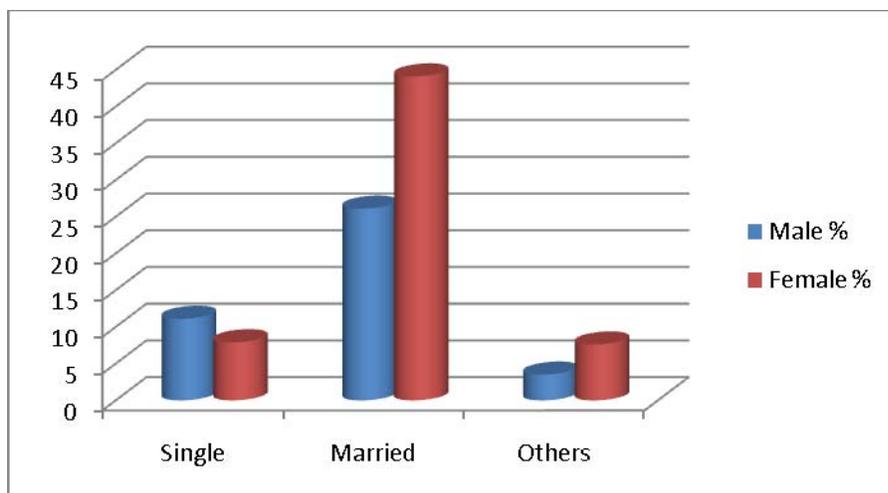
Figure 3: Percentages of UTIs per marital status in patients (n = 660)

Figure 3 shows that married individuals had the highest percentage (70%) occurrence of UTI in this study (p<0.05) and females predominate in all status with exemption of singles status were male was slightly higher.

DISCUSSION

The study shows the distribution and antimicrobial drugs susceptibility pattern of bacterial species isolated from patients with UTI in Medical Microbiology and Parasitology Department of National Hospital Abuja. Out of 2640 urine samples, 660 (25.3%) samples showed the growth of significant bacteriuria[21] [22] [23,] also observed such a low rate of growth positivity for UTI7[22] [23]. The possible cause of low rate of growth positivity might be due to urine samples obtained from patients under treatment, infection due to slow growing organisms or due to those organisms that were not able to grow on the routine media we used. However, very low growth rate (4.6%) has been earlier reported by another researcher[24].

Mostly, UTI is originated from colonic bacteria which comprise mainly Gram-negative bacteria. In our study, out of total 2640 bacterial isolates, 74.7% were gram-negative bacilli and only 25.3% were gram positive cocci. This study is similar to study done by Okada et al, in Japan, 70.2% isolates were Gram-negative bacilli and 29.8% was gram-positive bacteria[25].

Among the UTI associated pathogens isolated in this study, Escherichia coli had the highest occurrence of 49.5% compared to Staphylococcus aureaus (14.9%), Klebsiella sp (11.8%), Enterococcus faecalis (8.9%) and Pseudomonas aeroginosa (4.4%) while the lowest occurrence was recorded in Providencia spp (1.2%). Similar findings were earlier reported by Cheesbrough in the year 2002 [26].

Among gram-positive bacteria, *Staphylococcus aureus* was the most common. In this study, the incident was found to be 58.7% of the total bacterial isolates. Isolation of *S. aureus* from the urine should arouse suspicion of bacteremic infection of the kidney acquired by haematogenous spread, so a pure culture of *S. aureus* is considered to be significant regardless of the number of colony forming unit[5].

According to figure 6, around only 68% of gram negative bacteria were sensitive to Ciprofloxacin and Norfloxacin (56%). Similarly, sensitivity to Ciprofloxacin and Norfloxacin against gram-positive bacteria was found to be only 60%. In contrast to the result, Norfloxacin has been recommended as highly effective antimicrobial drug[27] [28].

Among gram-positive bacteria, the most effective drug was found to be Gentamicin (74%) followed by Amikacin (61%), Ciprofloxacin (60%), Erythromycin (57%) among the tested drugs, which has not included Nitrofurantoin. However, activity of Erythromycin in acidic urine is lower and is not recommended for antimicrobial susceptibility testing[29]. *Staphylococcus aureus* was found to be 74% sensitive towards Gentamicin and 42% sensitive towards

Cloxacillin. Comparatively lower rate of susceptibility towards Cloxacillin might be due to presence of Methicillin resistance *Staphylococcus aureus* (MRSA).

Antibiotic resistance is a worldwide problem. It is now generally considered as public health issue and has significant implication in health. Resistance to antimicrobial drugs is causing increasing morbidity and mortality due to infectious diseases. The problem of the bacterial resistance to antimicrobial drugs is more troublesome and common in developing countries like Nigeria.

An association seems to exist between sex and the nature of the uropathogens; almost all the isolates were more prevalent in females except Proteus sp and Enterococcus faecalis, which were more common in males. The predominance of Proteus specie in males may be due to the source of the infection, which is commonly associated with indwelling catheterization and prostate enlargement[30]. The age group with highest frequency of UTIs was 21–30 years with females predominating in all the age groups except in less than 1 and above 60 years (Fig. 7). This can be due to pregnancy in females and prostatic diseases in elderly male.

Furthermore, the results showed that married women are more likely to be affected than their single or widowed counterparts while the reverse was the case in males (Fig. 3). This could possibly be attributed to the polygamous nature of marriage in the area under study.

CONCLUSION AND RECOMMENDATION

This study reveals that UTI is a major health problem among patients receiving health care delivery at National Hospital Abuja and its environs. It equally shows that *Escherichia coli, Klebsiella pneumonia* and *Staphylococcus aureus* were the predominant uropathogen that causes UTI around this region.

Again, almost all the isolates in this study were sensitive to Gentamycin, Ciprofloxacin and Amikacin. There is also association of UTI with patient's age, sex and marital status. However, this type of study should be continued to periodically determine the changing pattern of pathogenic bacteria and their corresponding susceptible antimicrobial.

Gram-negative bacteria were established to be the major cause of urinary tract infection even from this study. *Escherichia coli* were found significantly the most predominant than others. Majority of Gram-negative bacteria showed susceptibility towards Ciprofloxacin, Gentamicin, Amikacin and Norfloxacin while Gram – positive are susceptible to Gentamicin, Amikacin, Ciprofloxacin and Erythromycin. However, this type of study should be a continuous exercise, to determine the changing pattern of pathogenic bacteria and their corresponding antimicrobial susceptibility patterns periodically.

It is highly recommended that culture and sensitivity report should be used while prescribing antimicrobial drugs for treatment of suspected UTI. There should be concrete hospital

antimicrobial drug policy and ensure strict adherent to it in order to prevent emergence of multi drug resistance organisms and the study should be a continuous one to further ensure prompt and early detection of MDR strains, and subsequently followed up with appropriate control and prevention actions.

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