



THERAPEUTIC MANAGEMENT OF URINARY TRACT INFECTIONS (UTI): A RETROSPECTIVE STUDY IN TWO TEACHING HOSPITALS IN NIGERIA

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Abstract

Urinary Tract Infection (UTI) is one of the most common diseases and a significant cause of morbidity in all age groups. There are large differences in the management of UTI with respect to definition, diagnosis and treatment. This retrospective study reviewed the diagnosis and drug treatment of UTI at the Teaching Hospitals of Ahmadu Bello University (ABUTH), Zaria and University of Maiduguri (UMTH). The results showed that majority of the infections were due to *Escherichia coli*, followed by *Klebsiella* species and *Staphylococcus aureus*. The symptoms were dysuria, suprapubic pain, fever and/or chills, and lower abdominal discomfort, which differed in order of occurrence at the two institutions. The infecting organisms were sensitive to pefloxacin, ceftriazone and gentamicin while the most frequently used antibiotics were gentamicin, ciprofloxacin and ampicillin/cloxacillin in decreasing order at ABUTH. At UMTH, ceftazidime, ofloxacin and gentamicin were frequently active against the infective organisms; and the most prescribed antibiotics were nitrofurantoin, ofloxacin, amoxicillin/clavulanic acid and co-trimoxazole in decreasing order. These results showed that institutional antibiotic policy in the treatment of urinary tract infections might have been based on the experience of the physician, cost of the drug and route of administration instead of prevalence and sensitivity patterns. It also showed that the guiding principle of the rational use of drugs is not strictly adhered to.

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INTRODUCTION

The urinary tract consists of the urethra, prostate gland, seminal vesicles (in males), urinary bladder, ureters, and kidneys. The term urinary tract infection (UTI) describes a variety of conditions relating to the parts of the tract in which microorganisms are present in significant quantities.

UTI may be seen solely as the presence of bacteria in the urine (bacteriuria), or signs and symptoms of bacterial invasion of one or more

components of the tract. However localized the infection is initially, the entire tract is at risk of infection (Diane, 1996).

The “non-specific” infections of the genitourinary tract are a group of diseases having similar manifestations, caused by the gram-negative rods (for example *Escherichia coli*, *Proteus vulgaris*) and gram-positive cocci (for example *staphylococci* and *streptococci*). They are to be distinguished from infections caused by “specific” organisms, each of which

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causes a clinically unique disease (e.g. tuberculosis, gonorrhoea, and actinomycosis). In acute infections, a single organism is usually found whereas mixed infections are often seen in chronic stages (Emil, 1981).

UTI continues to be the most common infectious disease for which medical treatment is sought. Researches have shown that the bowel type of organisms causes the majority of urinary tract infections (Jameson, 1976). They are identified by Gram negative staining and their differing ability to ferment various sugars in the laboratory. Such organisms are *Escherichia coli*, and other coliform types, *Bacillus proteus* and *Pseudomonas pyocyaneus* and some Streptococci (Jameson, 1976). They gain entry into the urinary tract either by ascending infection, haematogenous or lymphatic spread, or by direct extension from an infected organ (e.g. bowel). It has been shown that such pathogenic organisms live in the distal urethra without producing harm and may colonize the perineal skin. When they gain entry to the bladder and multiply, cystitis results (Jameson, 1976).

UTIs are the most common bacterial infections occurring in children and can have a significant effect on a child's health and well-being. UTIs also account for a significant number of cases of unexplained febrile illnesses in children less than 3 years of age. They are a major cause of hospitalisation and morbidity in children (Carlos *et al.*, 1995).

UTIs are classified by anatomical location lower tract (cystitis when the bladder is involved and urethritis when the urethra is involved) and upper tract (pyelonephritis when the kidney is involved) and are further sub-classified as complicated or uncomplicated. An uncomplicated UTI is defined as an infection in which there is no structural or neurological abnormality of the urinary tract that interfere with the normal flow of urine in the voiding mechanism of an otherwise healthy patient. A complicated UTI is the result of a congenital abnormality or distortion of the tract, trauma, a

stone, an indwelling catheter, an enlarged prostate, a neurological deficit, or an infection of a normal tract in a patient with an underlying disease, or one that is hospital acquired.

Opportunistic organisms and common community-acquired bacterial pathogens may produce a variety of complicated and uncomplicated UTI in patients infected with Human Immunodeficiency Virus (HIV), particularly those with Cluster-differentiation-4 -T-helper Lymphocytes counts (CD₄⁺ counts) of less than 200 per cubic millimetre (Roohollah and Mary, 1997). UTIs are the most frequent cause of septicaemia in the elderly (Morten and Morten, 1996).

There are certain risk factors that predisposes to UTIs. Morten and Morten (1996) reported that age and institutionalisation constitute substantial risk factors and that the prevalence varies with the type of institution. UTIs could be complicated by the presence of other conditions like pregnancy, diabetes, or any urological abnormality in the patient (David, 2000). Jodi and his colleagues reported that UTI is the most common complication of pregnancy and that it results in 5 times as many febrile episodes as viral infections (Jodi *et al.*, 1997).

There are large differences in the management of UTI with respect to definition, diagnosis and treatment. Research continues in an attempt to resolve the controversial issue of a better approach to treatment (Diane, 1996) and diagnosis.

The objective of this research work is to review the diagnosis and drug treatment of urinary tract infections at the teaching hospitals of Ahmadu Bello University, Zaria (ABUTH), and University of Maiduguri, Maiduguri (UMTH), Nigeria, with the aims of identifying major diagnostic parameters and drug treatment pattern so as to improve on rational use of drugs.

METHOD

The data of patients that had significant bacteriuria were collated from the records of

urine-microscopy-culture-and-sensitivity tests in Microbiology Departments of ABUTH (covering the period; January 1999 to January 2000) and UMTH (covering the period; January 1996 to January 1997). Different time duration had to be adopted for UMTH because the records for 1999/2000 were not complete. The data was used to retrieve medical folders of UTI-patients in the Health Records Departments of the two Teaching Hospitals. A total of 435 patients in ABUTH and 361 patients in UMTH were used for the study. Information such as patient's bio-data, clinical presentations of disease conditions at the time of presentation in the hospital, the various laboratory and physical examinations conducted, profile of the disease and drugs prescribed and the outcome of drug therapy were recorded with the aid of a well-elaborate proforma.

RESULTS AND DISCUSSIONS

In both study centres, *Escherichia coli* was the most frequently encountered microorganism (53.5% for ABUTH and 37.4% for UMTH), followed by *Klebsiella* and *Staphylococcus aureus* (Tables 1 and 2). This predominance was in agreement with the work of Andriole *et al.*, (1991), which stated that 82% of uncomplicated UTIs are due to *Escherichia coli*. Diane (1996) also reported that *Escherichia*

coli accounted for over 80% of initial infections and approximately 50% of recurrent infections. However, the degree of predominance of *Escherichia coli* over other bacteria in the above stated reports is far greater than what was obtained in this study.

The most frequent symptoms of UTI recorded were dysuria, suprapubic pain, fever and/or chills, and lower abdominal discomfort, which differed in order of occurrence at the two institutions. Roohollah and Mary (1997), reported that the classic triad of urinary frequency, dysuria, and urgency are the most common signs of UTI. Urinary frequency and urgency were not among the highly presented complaints, probably because most patients did not consider them to have much medical relevance as to warrant presenting it to a physician.

The fact that most patients presented with fever and/or chills, and suprapubic pains, suggested that the majority of the cases were of the upper UTIs. Diane (1996), reported that the classical presentation of an upper UTI includes non-specific complaints of headache, malaise and nausea and vomiting. In association with these non-specific findings; the patient may complain of suprapubic pain, costovertebral angle- (cva) tenderness, fever and chills.

Table 1: The prevalence of the various species of infecting agents among patients in the ABUTH Zaria

Infecting Agent	No. of Cases	Percentages
<i>Escherichia coli</i>	213	53.5
<i>Klebsiella species</i>	92	23.1
<i>Staphylococcus aureus</i>	34	8.5
<i>Pseudomonas earuginosa</i>	6	1.5
<i>Proteus vulgaris</i>	19	4.8
<i>Acinobacter</i>	3	0.7
<i>Candida</i>	12	3.9
<i>Citrobacter</i>	14	3.5
<i>Enterobacter</i>	2	0.5
<i>Polymorph</i>	3	0.7
<i>Providencia species</i>	14	3.5

Table 2: The prevalence of the various species of infecting agents among patients In UMTH Maiduguri

Infecting Agent	No. of Cases	Percentages
<i>B. Haemolytic Streptococcus</i>	1	0.3
<i>Non Haemolytic Streptococcus</i>	6	1.7
<i>Coliform</i>	4	1.1
<i>Escherichia Coli</i>	131	37.4
<i>Klebsiella species</i>	84	24.0
<i>Staphylococcus aureus</i>	53	15.1
<i>Pseudomonas aeruginosa</i>	35	9.9
<i>Proteus vulgaris</i>	36	10.3

Table 3: The frequency of various patient-complaints in ABUTH Zaria

Complaint	No of Patients	Percentages
Urinary frequency	3	1.84
Urinary urgency	1	0.61
Dysuria	17	12.20
Lower abdominal discomfort	9	6.13
Lumbosacral backache	4	2.44
Headache	16	10.98
Malaise	1	0.61
Nausea and vomiting	13	9.76
Suprapubic pain	23	15.86
Fever and chills	29	20.1
Urethral discharge	8	5.49
None/others	19	13.42

Table 4: The frequency of various patient complaints among 202 UTI cases in UMTH Maiduguri (January 1996 to January 1997)

Complaint	Percentage
Urinary frequency	7.84
Urinary urgency	4.48
Dysuria	18.48
Lower abdominal discomfort	14.00
Lumbosacral backache	2.80
Headache	4.48
Malaise	2.24
Nausea and vomiting	3.36
Suprapubic pain	16.24
Fever and chills	10.08
Urethral discharge	5.04
None and others	11.76

Table 5: *In-vitro* sensitivity evaluation of UTI against a range of antibiotics in ABUTH

Antibiotic	Number	Percentages
Amoxi/clavulanate	10	1.40
Ampicillin	3	0.42
Azithromycin	30	4.20
Chloramphenicol	40	5.60
Ceftriaxone	149	20.86
Ciprofloxacin	66	9.24
Cephalexin	4	0.56
Cefuroxime	25	3.50
Gentamicin	120	16.80
Lincomycin	1	0.14
Norfloxacin	6	0.84
Ofloxacin	27	3.78
Pefloxacin	175	24.50
Streptomycin	35	4.90
Cotrimoxazole	5	0.70
Tetracycline	8	1.12
Sulbactam	6	0.84

Table 6: *In-vitro* sensitivity evaluation of UTI against a range of antibiotics in UMTH Maiduguri

Antibiotic	Number	Percentages
Amoxi/clavulanate	88	7.50
Azithromycin	87	7.40
Chloramphenicol	8	0.70
Ceftazidime	217	18.50
Cephalexin	56	4.76
Gentamicin	173	14.71
Cefotaxime	58	4.90
Cloxacillin	16	0.3
Cefuroxime	108	9.20
Nitrofurantoin	19	1.62
Nalidixic acid	8	0.68
Ofloxacin	207	17.60
Tetracycline	36	3.06
Tobramycin	1	0.10
Cotrimoxazole	27	2.30
Sulphonamides	3	0.30
Streptomycin	6	0.50

In ABUTH, the antibiotics with the highest number of sensitivity values were pefloxacin, and ceftriazone followed by gentamicin and cefalexin. While in UMTH the highest number of

sensitivity was observed with ceftazidime, followed by ofloxacin and gentamicin (Tables 5 and 6).

Table 7: Drug utility in successfully treated UTI - patients in ABUTH Zaria

Drug	Percentage (Monotherapy)	Percentage (Combination therapy)
Ceftriazone	4.2	-
Gentamycin	14.0	32.2
Amoxicillin	5.6	4.2
Ampicillin/cloxacillin	8.4	5.6
Amoxicillin/clavulanate	1.4	5.6
Ofloxacin	-	-
Azithromycin	-	-
Metronidazole	-	1.4
Nitrofurantoin	-	-
Cotrimoxazole	2.8	5.6
Mist. Potassium Citrate	-	1.4
Praziquantel	-	11.4
Amitriptyline	-	-
Paracetamol	-	-
Streptomycin	5.6	-
Chloramphenicol	-	7.0
Pefloxacin	5.6	-
Ciprofloxacin	4.2	2.8
Sulbactam	2.8	-
Ampicillin	2.8	-

Table 8: Drug utility in successfully treated UTI - patients in UMTM Maiduguri

Drug	Percentage (Monotherapy)	Percentage (Combination therapy)
Ceftriazone	1.0	1.0
Gentamycin	-	6.0
Amoxicillin	-	2.0
Ampicillin/cloxacillin	-	4.0
Amoxicillin/clavulanate	7.0	2.0
Ofloxacin	15.0	4.0
Azithromycin	1.0	1.0
Metronidazole	1.0	-
Nitrofurantoin	13.0	7.0
Cotrimoxazole	5.0	3.0
Mist. Pot. Citrate	-	2.0
Amitriptyline	1.0	3.0
Praziquantel	-	1.0
Paracetamol	-	10.0
Spironolactone	-	1.0
Erythromycin	2.0	1.0
Cefuroxime	3.0	-
Ampicillin	-	1.0
Doxycycline	-	1.0
Nalidixic acid	1.0	-

The result of the study on drug utility in 142 successfully managed UTI patients in the ABUTH Zaria (Tables 7 and 8) showed that gentamicin and ampicillin/cloxacillin were the most commonly utilized antibiotics (46.2% and 14.0% respectively). Gentamycin was used alone in 14.0 percent of the cases and along with other antibiotics (in combination therapy), in 32.2 percent of the cases. Other antibiotics utilized included amoxicillin (5.6% alone and 4.2% in combination with another antibiotic), cotrimoxazole (2.8% alone and 5.6% in combination with another drug), while amoxicillin/clavulanate (1.4% and 5.6%) and ciprofloxacin (4.2% and 2.8%) follows respectively. The invitro results had indicated greater activity with pefloxacin and ceftriaxone than gentamicin. Yet the choice or utility of the latter was higher. This showed that the prescriber might have based his/her judgement on the issues of cost, availability, and perhaps adverse drug effects. Ibrahim (2001) described indiscriminate use of antibiotics as an example of irrational use of drugs.

Conclusion

The majority of the UTIs at the two study centres (ABUTH and UMTH) were due to *Escherichia coli*, *Klebsiella specie* and *Staphylococcus aureus* were the next most frequent isolates. The predominant symptoms of UTI were dysuria, suprapubic pains, fever and/or chills, and lower abdominal discomfort.

The fact that the most sensitive drugs were not the highly utilised showed that institutional antibiotic policy in the treatment of UTIs might have been based on the experience of the prescriber, cost of the drugs and route of administration instead of prevalence and sensitivity patterns. As a result, it was concluded that the guiding principle of Rational Use of Drugs is not strictly adhered to.

Table 8 shows the outcome of the study of drug utility among 202 successfully managed UTI patients in UMTH. Nitrofurantoin (13.0% alone and 7.0% in combination therapy) and ofloxacin (15.0% alone and 4.0% in combination therapy) had the highest utility among the patients. Other drugs used included amoxicillin/clavulanate (7.0% alone and 2.0% in combination therapy) and cotrimoxazole (5.0% alone and 3.0% in combination therapy). The drug with the heighest utility did not show promising activity in the *in vitro* test.

In both centres, the drugs with highest number of sensitivity did not turn out to be the highly utilised. Factors such as cost, availability, route of administration, etc might have influenced the choice. The use of nitrofurantoin in the management of UTI (as practiced in UMTH) was not in agreement with the principle of rational drug use since the drug is a urinary sterilising agent. It is recommended for prophylaxis.

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