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Full Length Research Paper

Incidence of urinary tract infections (UTI) among children and adolescents in Ile-Ife, Nigeria

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This study was carried out in order to determine the incidence of urinary tract infection in children and adolescents, identify the uro-pathogens responsible for the infection and study the antibiotic sensitivity patterns of the uro-pathogens. Clean voided mid-stream urine samples were collected in sterile universal bottles from 301 children and adolescents between the ages of 5 and 18 years at the Obafemi Awolowo University Teaching Hospital complex (OAUTHC) Ile-Ife, Nigeria from December 2005 - July 2006. Culture plates with bacteria counts greater than or equal to $1x10^5$ cfu-ml^{-1} were taken as positive, thus indicative of Urinary Tract Infection (UTI). The bacteria isolates were identified based on colony morphology characteristics, Gram stain reaction and biochemical tests using API 20E kits. The identified bacteria were then tested *in vitro* with standard antibiotics disc to determine their antibiotics sensitivity patterns. The result of this study shows that 36 (11.96%) of the 301 patients studies had UTI. Of the 124 females examined, 28 (22.4%) had positive urine culture while 8 (4.56%) of the 177 males had significant bacteriuria. A total of 36 bacterial isolates were obtained. *Escherichia coli* constituted the predominant organism and was responsible for (52.77%) of the cases of UTI. This was followed by *Klebsiella* sp. (25%), *Proteus mirabilis* (13.89%), *Streptococcus faecalis* (5.56%) and *Pseudomonas aeruginosa* (2.78%). The antibiotics sensitivity test revealed a high level of resistant to cotrimoxazole, amoxicillin and colistin as more than 60% of the isolates were resistance to these. This study highlights the presence of multi-resistance *P. aeruginosa* and poor compliance of the pathogens *in vitro* to antibiotics commonly used in treating UTI. It is therefore suggested that appropriate antimicrobials be administered to reduce the risk of multiply resistance organisms developing and avert ineffectiveness of antibiotics. Prompt therapeutic intervention is also essential to prevent cases of asymptomatic UTI from becoming symptomatic with resultant damage.

Key words: UTI, uro-pathogens, antibiotic sensitivity.

INTRODUCTION

Urinary tract infections (UTI) are among the most common conditions causing individuals to seek medicare. They are also among the most common bacterial infections in humans, both in the community and hospital settings (Hooton et al., 1997), and have been reported in all age groups in both sexes. UTI may be asymptomatic in many cases, while it may be accompanied by dysuria, cystitis and pyelonephritis in other patients (Karaou and Hanna, 1981). UTI are responsible for considerable morbidity and when associated with urinary obstruction or renal papillary damage, can lead to serious kidney damage.

UTI are a serious health problem affecting millions of people each year. In the USA, it is estimated from surveys of office practices, hospital-based clinics and emergency departments that there are over eight million cases of UTI annually (National Institutes of Health, 1999). The prevalence of asymptomatic bacteriuria in Sweden was reported as being between one and three percent from neonatal period to school age (Rudolph, 1996), while in Saudi Arabia at prevalence rate of 5.3% was report-

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ed (Omar et al., 1992). In Nigeria, Okafor et al. (1993) found at prevalence rate of 2.1% in Enugu, Akinkugbe et al. (1973) reported prevalence rates of 24 and 6% among rural and urban children, respectively, while Bello et al. (1988) reported that the annual incidence of symptomatic bacteriuria was 6.5 per 1000 admissions.

UTI in children are a significant source of morbidity, particularly when associated with abnormalities (Ross, 1994). Vesico-ureteral reflux is the most commonly associated abnormality and reflux nephropathy is an important cause of end stage renal disease in children and adolescents (Bailey, 1992). However, when reflux is recognized early and managed appropriately, renal insufficiency is rare. Some adolescents who present with an apparently uncomplicated first urinary tract infection turn out to have considerable reflux. Subclinical infections can sometimes lead to severe bilateral renal scarring. Therefore, even a single documented urinary tract infection in an adolescent must be taken seriously. In this study, we determined the incidence of urinary tract infections in adolescents in Ile-Ife, Nigeria; identified the uropathogens responsible for the infection; and studied the patterns of antibiotic sensitivity of the uropathogens and correlated these with patient symptom profile. This was all done in order to ascertain appropriate antibiotic treatment therapy.

MATERIAL AND METHODS

Study population

Urine samples were collected from a total of 301 children and adolescents between the ages of 5 to 18 years - during the period of December 2005 - July 2006. All these persons were outpatients visiting the Obafemi Awolowo Teaching Hospital Complex (OAU-THC) Ile-Ife, Nigeria. In the collection of urine from patients the following exclusion criteria were used: - Patients who have been on antibiotics for at least three days were excluded; - patients who have not attained the age of 5 years and patients who took large quantities of fluids less than an hour before coming to clinic.

Sterilization of media and materials

The media used were Nutrient Agar (NA) from Biotec Limited, while Nutrient Broth (NB), MacConkey agar (MCA), Blood Agar (BA) and Muller Hinton Agar were supplied by Oxoid Limited All glassware were washed with detergent and rinsed with water, then allowed to dry. The glassware were later wrapped in aluminum foil and sterilized in a hot air oven at 160°C for 3 h. Media were sterilized by autoclaving at 121 Ib g^{-1} for 15 min.

Urine collection

Clean voided mid-stream urine specimens were obtained from patients in sterile universal bottles which were given to their parents for collections and transported to the laboratory immediately in ice pack bags for urinalysis.

Culturing of urine sample

Ten-fold serial dilutions were made by transferring 1.0 ml of the sample in 9.0 ml of sterile physiological saline. One ml was then poured into molten nutrient agar in Petri dishes and rotated gently to mix. The contents were allowed to set and the plates were then incubated at 37°C for 24 h. Bacterial colonies appearing on the plates after the incubation period were enumerated to determine urine samples with significant bacteriuria. A loopful of each urine sample was also streaked on MacConkey agar and Blood agar plate for the isolation of the bacteria present in the urine. After incubation, plates with growth were selected, the colonies were isolated using inoculating loop and subsequently subcultured on agar slants for use in further tests.

Table 1. Age and sex distributions.

Age (years)	Males	Female	Total	Percent (%) of Total
5-11	08	18	26	72.2%
12-18	-	10	10	27.8%
Total	08 (22.2%)	28 (77.8%)	36	100%

Bacterial identification

The methods used in the identification and characterization of isolated bacteria include Gram stain followed by microscopic examination, motility test and biochemical tests using API 20E kit (BioMerieux).

Antibiotic sensitivity test

Bacterial isolates were tested for anti-microbial sensitivity, using the agar-disc diffusion method as described by Bauer et al. (1996). The turbidity of the bacterial suspension was then compared with MacFarland's barium sulfate standard solution, corresponding to 1.5 = 10 cfu ml^{-1}. The standardized bacterial suspension was then swab-inoculated onto Muller Hinton Agar (Oxoid) using sterile cotton swabs, which were then left to dry for 10 min before placing the antimicrobial sensitivity discs. Antibiotics impregnated on discs of 8 mm in diameter were used for the test. Disks containing the following antibacterial agents were placed onto the agar surface and incubated over- night: Erythromycin (5 µg ml^{-1}); Ciprofloxacin, Cloxacilin and Gentamycin (10 µg ml^{-1}); Amoxicillin (24 µg ml^{-1}); Colistin and Cotrimoxazole (25 µg ml^{-1}); Ofloxacin, Tetracyclin, Augmentin and Nalidixic Acid (30 µg ml^{-1}); Chloramphenicol (32 µg ml^{-1}); Nitrofurantoin (200 µg ml^{-1}) The antibiotics were supplied by Fondon (Nigeria) and Abtek laboratories (Untied Kingdom). After incubation, the diameter of the zone of inhibition was measured and compared with a zone diameter interpretative chart to determine the sensitivity of the isolates to the antibiotics. The procedure is intended for *in vitro* susceptibility testing of common rapidly growing and certain fastidious bacterial pathogens.

RESULTS

There were 301 patients (177 males and 124 females) aged between 5 years to 18 years who visited Obafermi Awolowo University Teaching Hospital Complex (OAU-THC) Ile-Ife, Nigeria, during the study period December 2005 - July 2006 and from whom urine sample were collected. Of these patients, 36 (11.96%) had significant bacteriuria, that is, they had at least 10^5 cfu of bacteria per ml of urine. Table 1 show the sex and age of patients with significant bacteriuria. Of the 124 females, 28

Table 2. Distribution of bacterial isolates from sexes.

Bacterial isolate	Female	Male	Total
Escherichia coli	15 (78.9%)	4 (21.1%)	19(52.77%)
Pseudomonas aeruginosa	1 (100%)	-	1(2.78%)
Streptococcus faecalis	2 (100%)	-	2(5.56%)
Proteus mirabilis	4 (80%)	1(20%)	5(13.89%)
Klebsiella spp.	6 (66.7%)	3(33.3%)	9(25.0%)
Total	28 (77.8%)	9(22.2%)	36(100%)

(22.4%) came up with positive cultures while 8 (4.6%) of the 177 males had significant bacteriuria. Fifty five percent of patients with positive cultures presented with symptoms that are not indicative of urinary tract infection such as catarrh, cold ear ache, cough, septic rash, tineasis etc., 2.78% had haematuria, 27.8% presented with abdominal pain and vomiting, 2.78% had vaginal discharge, while 11.1% presented with fever (body temperature ≥ 38°C). Five different microorganisms were isolated and identified from 36 positive cultures and included *Escherichia coli, Klebsiella* spp., *Proteus mirabilis, Streptococcus faecalis* and *Pseudomonas aeruginosa*. *E. coli* was isolated in 19 cases (52.77%), followed by *Klebsilla* spp. in 9 cases (25%), *P. mirabilis* in 5 patients (13.89%), *S. faecalis* was isolated in 2 cases (5.56%) and *P. aeruginosa* in one patient (2.78%), as shown in Table 2.

Antibiotic sensitivity testing

The Gram-negative bacterial isolates were tested against 10 different antibiotics, while eight antibiotics were used to determine the sensitivity pattern of the Gram-positive isolates. From the results shown in Tables 3 and 4, the following was observed: 47% of the isolates were sensitive to amoxicillin, 33.3% to cotrimoxazole, 50% to nitrofurantoin, 77.8% to ofloxcicin, 73.5% to nalidixic acid, 63.9% to gentamycin, 97.1% to ofloxacin, 27.8% to augmentin, 30.6% to colistin 61.1% to tetracycline and 100% of *S. faecalis* were sensitive to erythromycin and chloramphenicol while 50% were sensitive cloxacilin (Tables 3 and 4).

DISCUSSION

The study was undertaken to determine the incidence of urinary tract infection in children and adolescents as well as to evaluate the bacterial agents involved in this UTI. Out of the 301 patients (124 female and 177 males between the ages of 5 and 18 years) that participated in this study only 36 (11.96%) had urine samples with significant bateriuria, and 28 (77.8%) of these patients were female between the ages of 5 - 18 years. The findings in this study is similar to that reported by Okafor et al. (1993) where a prevalence rate of 16.5% was reported in patients between ages 0 and 20 years. However, the result obtained in this study (11.96%) appears low when compared with those obtained elsewhere. For instance Olowu (1996) reported an incidence of 28.1% in a population of 2780 out-patients at the Lagos University Teaching Hospital and Anochie et al. (2001) reported a prevalence of 30% among a population of 100 school children, between ages 4 - 18 years in a rural community in Enugu. The low incidence of urinary tract infection reported here in Ile-Ife may be attributed to the extensive health care talk given regularly by the staff of the school's health service department to school children in the locality.

A large number of microorganisms were isolated from female patients with the high bacterial count being 1.2 x 10^7 cfu ml^{-1} and the lowest bacterial count being 1.5 x 10^6 cfu ml^{-1}, while the bacterial counts in males ranged between 8 x 10^5 cfu ml^{-1} to 6.3 x10^6 cfu ml^{-1}. This study shows a higher incidence of urinary tract infection in females than males. In this study, 77.8% of females had positive urine cultures and this is similar to those obtained by other authors. Anochie et al. (2001) reported a predominance of female patients in a study carried out to determine the influence of instruction about the method of urine collection and storage on the prevalence of urinary tract infection. Similar findings were reported by Olowu (1996). The higher incidence of urinary tract infections in females might be as a result of a variety of factors, such as the close proximity of the female urethral meatus to the anus (Lipsky, 1990) and incomplete and in coordinate voiding of urine in school girls which is often associated with constipation and encourages infection of the urinary tract (Mond et al., 1970). Alternations in vaginal microflora also play a critical role in encouraging vaginal colonization with coliforms and this can lead to urinary tract infection (Hooton et al., 1997).

The symptoms noted in the majority of the patient were not indicative of urinary tract infection referable to the renal system. Fifty five percent of patient with positive culture showed symptoms such as catarrh, cold, ear ache, cough and septic rash, 2.78% had haematuria, 27.8% had abdominal pain with vomiting, 2.78% had vaginal discharge, while 11.1% had fever (body temperature≥ 38°C). The findings are similar to those of Morton and Lawande (1982) in Zaria. They found urinary tract infection in 10% of children with fever and 22% with diarrhea while Anochie et al. (2001) reported 65 cases of fever in children with positive urine cultures. It is therefore suggested that urinary tract infection should be investigated in any child that presents with a history of non-specific fever, even in the absence of symptoms referable to the renal system.

A total number of 36 isolates were obtained from the 36 patients with positive cultures, that is only one bacterial species was isolated from each patient, suggesting a

Table 3. Antibiotics sensitivity pattern of Isolates

ISOLATES	AMX	COT	NIT	CPX	NAL	GEN	OFL	AUG	COL	TET	ERY	CXC	CHL
Escherichia coli	S	S	S	R	S	S	S	S	S	S	ND	ND	ND
Escherichia coli	R	R	S	S	S	R	S	R	R	S	ND	ND	ND
Streptococcus faecalis	S	*R*	ND	ND	ND	S	ND	S	ND	S	S	R	S
Pseudomonas aeruginosa	R	R	R	S	R	R	S	R	R	R	ND	ND	ND
Escherichia coli	S	S	R	S	R	S	S	R	R	S	ND	ND	ND
Escherichia coli	R	R	R	S	S	S	S	R	R	S	ND	ND	ND
Streptococcus faecalis	S	S	ND	ND	ND	S	ND	S	ND	ND	S	S	S
Klebsiella spp.	R	R	R	S	R	R	S	R	R	D	ND	ND	ND
Proteus mirabilis	S	S	R	R	R	R	R	R	S	R	ND	ND	ND
Escherichia coli	R	R	R	S	S	S	S	R	R	S	ND	ND	ND
Escherichia coli	R	S	S	S	S	S	S	R	R	S	ND	ND	ND
Escherichia coli	R	R	S	S	S	R	S	R	R	S	ND	ND	ND
Klebsiella spp.	R	S	S	S	R	R	S	R	R	R	ND	ND	ND
Escherichia coli	S	S	R	S	R	S	S	R	R	S	ND	ND	ND
Escherichia coli	S	S	R	S	S	S	R	S	S	S	ND	ND	ND
Escherichia coli`	R	R	S	S	R	R	S	S	R	S	ND	ND	ND
Klebsiella spp.	R	S	S	S	S	R	S	S	R	R	ND	ND	ND
Proteus mirabilis	R	R	R	S	R	S	S	R	R	S	ND	ND	ND
Klebsiella spp.	S	R	S	S	S	S	S	S	S	S	ND	ND	ND
Klebsiella spp.	S	R	S	R	S	S	S	R	R	R	ND	ND	ND
Escherichia coli	S	R	S	R	R	R	S	S	S	R	ND	ND	ND
Klebsiella spp.	R	R	R	S	R	R	S	S	R	R	ND	ND	ND
Escherichia coli	S	R	S	R	R	S	S	R	R	R	ND	ND	ND
Klebsiella spp.	R	R	R	S	S	S	S	R	R	R	ND	ND	ND
Proteus mirabilis	R	R	R	S	S	R	S	R	R	S	ND	ND	ND
Escherichia coli	S	R	S	S	S	R	S	R	S	S	ND	ND	ND
Proteus mirabilis	R	R	S	S	S	S	S	R	S	S	ND	ND	ND
Escherichia coli	R	R	R	S	S	S	S	S	S	S	ND	ND	ND
Escherichia coli	R	S	R	S	S	S	S	R	S	R	ND	ND	ND
Escherichia coli	S	S	R	S	S	R	S	R	S	R	ND	ND	ND
Klebsiella spp.	R	R	R	S	R	S	S	R	R	S	ND	ND	ND
Escherichia coli	S	R	S	S	S	S	R	S	S	S	ND	ND	ND
Klebsiella spp.	S	S	R	S	R	S	S	R	R	S	ND	ND	ND
Proteus mirabilis	R	R	R	S	R	S	S	R	R	R	ND	ND	ND
Escherichia coli	S	R	S	S	S	R	S	S	S	S	ND	ND	ND
Escherichia coli	S	S	S	R	S	S	S	R	S	S	ND	ND	ND

AMX = Amoxicillin 24 µgml^{-1}
COT = Cotrimoxazole 25 µg ml^{-1}
NIT = Nitrofurantoin 200 µg ml^{-1}
CPX = Ciprofloxacin 10 µg ml^{-1}
NAL = Nalidixic Acid 30 µg ml^{-1}
GEN = Gentamycin 10 µg ml^{-1}
OFL = Olfoxacin 30 µg ml^{-1}
AUG = Augmentin 30 µg ml^{-1}
COL = Colistin 25 µg
CXC = Cloxacilin 10 µg ml^{-1}
TET = Tetracyclin 30 µg ml^{-1}
ERY = Erythromycin 5 µg ml^{-1}
CHL = Chloramphenicol 32 µg ml^{-1}
ND = Not Determined

Table 4. Number and percent (%) susceptibility of isolates.

ISOLATES	No. of ISOLATES	AMX	COT	NIT	CPX	NAL	GEN	OFL	AUG	COL	TET	ERY	CXC	CHL
Escherichia coli	19	11 (57.9)	8 (42.1)	12 (63.1)	15 (78.9)	13 (68.4)	11 (57.9)	19 (100)	6 (31.57)	8 (42.1)	14 (73.7)	ND	ND	ND
Pseudomonas aeruginosa	1	0	0	0	1 (100)	0	1 (100)	1 (100)	0	0	0	ND	ND	ND
Streptococcus faecalis	2	2 (100)	1 (50)	ND	ND	2 (100)	ND	2 (100)	ND	2 (100)	2 (100)	2 (100)	1 (50)	2 (100)
Proteus mirabilis	5	1 (20)	1 (20)	1 (20)	4 (80)	4 (80)	3 (60)	4 (80)	0	2 (50)	2 (50)	ND	ND	ND
Klebsiella spp.	9	3 (33.3)	3 (33.3)	4 (44.4)	8 (88.8)	8 (88.8)	5 (55.6)	9 (100)	2 (22.2)	1 (11.1)	4 (44.4)	ND	ND	ND
Total (%)	36	17 (47.2)	12 (33.3)	17 (50)	28 (77.8)	25 (73.5)	23 (63.9)	33 (97.1)	10 (27.8)	11 (30.6)	22 (61.1)	2 (100)	1 (50)	2(100)

AMX = Amoxicillin 24 μgml^{-1}
COT = Cotrimoxazole 25 μg ml^{-1}
NIT = Nitrofurantoin 200 μg ml^{-1}
CPX = Ciprofloxacin 10 μg ml^{-1}
NAL = Nalidixic Acid 30 μg ml^{-1}
GEN = Gentamycin 10 μg ml^{-1}
OFL = Olfoxacin 30 μg ml^{-1}
AUG = Augmentin 30 μg ml^{-1}
COL = Colistin 25 μg
CXC = Cloxacilin 10 μg ml^{-1}
TET = Tetracyclin 30 μg ml^{-1}
ERY = Erythromycin 5 μg ml^{-1}
CHL = Chloramphenicol 32 μg ml^{-1}
ND = Not Determined

mono-microbial nature of infection in the study population. The 36 isolates were made up of five different organisms. They are *E. coli*, *S. faecalis, Klebsiella* spp., *P. aeruginosa* and *P. mirabilis*. *E. coli* was the most common organism isolated from patients with significant bateriuria and was isolated from 19 case (52.78%) followed by *Klebsiella* spp. in 9 cases (25%), *P. mirabilis* in five patients (13.9%), *S. faecalis* was isolated in two cases (5.56%) and *P. aeruginosa* in one patient (2.78%). The pattern and frequency of occurrence of the bacterial isolates found in this study is similar to those reported by other workers. Alausa and Onile (1984) reported in their study that *E. coli* was the most commonly isolated pathogen in significant bacteriuria. The findings of Bishara et al. (1997) in Israel agreed with this statement. They reported that *E. coli* was responsible for 52% of cases of urinary tract infection, *Klebsiella* spp. (14%), *Proteus* spp. (95%) and *Enterococcus* spp. in 4%. A higher percentage of the organisms found in this study were isolated mainly from female. *E. coli* was isolated in 15 of the females, *P. aeruginosa* in one female and which is the only one isolated in the study *S. faecalis* in two females, *P. mirabilis* in four females and in one of males while *Klebsiella* spp. was responsible for UTI in 6 females. The pattern reported in this work is similar to that reported by Okafor et al. (1993) in which 20.7% of case of urinary tract infection was reported in males. The result of this study shows that 47% of the isolates were sensitive to amoxicillin, 33.3% to cotrimoaxole, 50% to nitrofuratoin 30.6% to colistin, 63.9% to gentamycin, 77.8% to ciproflaxin and 97.1% ofloxacin.

The antibiotic sensitivity test of this study shows that ofloxacin was the most effective antibiotic in *in vitro* testing followed by ciproflaxin which was effective against 77.8% of the pathogens. Similar results with quinolones have been reported by other authors. Gupta et al. (1999) reported in their study that resistance to fluoroquinolones was absent among Gram-negative pathogens and Christiaen et al. (1998) reported that 1% of the pathogens were resistant to fluoroquinolones. This low resistance of pathogens might be attributed to the fact that quinolones are relatively new antibiotics and have not been extensively used to warrant resistance developing against them by pathogens. More so, quinolones have been indicated to be effective in the treatment of urinary tract infection caused by Gram-negative bacteria such as *E. coli*, *Serratia* spp., *P. aeruginosa*, and *Proteus* spp. (Prescott et al., 2002). A reduced sensitivity of *E. coli* to nitrofuratoin was observed in this study as only 63.6% of the *E. coli* was sensitive to the antibiotics as opposed to the findings of Goldraichi and Manfrori (2002), who reported a higher efficacy of the drug against *E. coli in vitro*. They reported a sensitivity of *E. coli* to nitrofuratoin of 92, 95 and 94%, respectively over a three-year period. Olowu and Oyetunji, (2003) reported a 57.9% sensitivity of pathogens towards nitrofuratoin; this is similar to that found in this study, in which 50% of the pathogens were sensitive to nitrofuratoin. The sensitivity of *E. coli* to tetracycline in this study was 73.7% and was similar to that reported by Gupta et al. (1999) who reported a 76% sensivitivity of *E. coli* to tetracycline.

In this study, colistin was the most ineffective antibiotic in *in vitro* testing, since 70% of the pathogens were resistant to it. Olowu and Oyetunji (2003) also reported a resistance rate of 63.16% to colistin in their study. Resistance of cotrimoxazole in this study was quite high compared to those commonly reported. In this study, 66.7% of the pathogens were resistance to cotrimoxazole. Resistance of *E. coli* to cotrimoxazole was 57.9% and is in contrast to results obtained elsewhere. Christiaen et al. (1998) reported a resistance of 17% to cotrimoxazole and a similar result was reported for resistance to quinolones. *Klebsiella* spp. showed a high level of resistance to most of the antibiotics used. A resistance of 66.7% was seen against amoxicillin and cotrimoxazole, 88.9% were resistant to colistin, 55.6% to tetracycline and nitrofurantoin but all were sensitive to ofloxacin. This result is similar to that reported by Reish et al. (1993).

The study on the outbreak of multi-resistance *Klebsiella* in a neonatal intensive care unit in a hospital in Israel in which the *Klebsiella* isolates were resistant to chloramphenicol, gentamycin, cefuroxin but sensitive to quinolenes. *P. aeruginosa* isolated in this study was resistant to seven out of the ten antibiotics *in vitro* (Amoxicillin, colistin, nitrofuratoin, nalidixic acid augmentin, tetracycline and cotrimoxazole), but sensitive to gentamycin, ofloxacin and ciprofloxacin. Multi-resistance *P. aeruginosa* was also isolated by Olowu and Oyetunji (2003) in their study of nosocomial urinary tract infection. A high level of resistance of *P. mirabilis* was seen *in vitro* against the antibiotic used, 80% of the pathogen were resistant to amoxicillin, cotrimoxazole and nitrofuratoin.

In conclusion, this study determined the incidence of urinary tract infection in children and adolescents in Ile-Ife and highlighted the major bacterial agent involved in this condition. The pattern of isolates reported in this study is consistent with the usually reported pattern, with *E. coli* being the most common organism isolated in cases of urinary tract infection. This was followed by *Klebsiella* spp., *P. mirabilis*, *S. faecalis* and *P. aeruginosa*.

The study reveals the prevalence of multi-resistance *P. aeruginosa* and *Klebsiella* spp. in the environment; hence caution must be exercised whenever antibiotics therapy is to be administered. This study shows a high level of resistance to cotrimoxazole, amoxicillin and colistin as more than 60% of the isolates were resistant to them *in vitro* and, as such, these antimicrobials may not be suitable for treating case of UTI in this locality.

However, a large proportion of the isolates were sensitive to ofloxacin, ciprofloxacin, nalidixic acid and gentamycin, and should be considered as first line drugs for treating cases of urinary tract infection in this environment. Ciproflaxin and ofloxacin are however best avoided in children as they have been shown to cause arthropathy in animal's studies.

Since urinary tract infection may be asymptomatic in most cases (as this study has shown), it is therefore suggested that routine screening of patie unexplained sources of fever be done for urinary tract infection and the appropriate antimicrobials administered after sensitivity tests have been carried out in order to prevent the cases becoming symptomatic later with resultant renal damage.

REFERENCES

Akinkugbe FM, Familusi JB, Akinkugbe OO (1973). Urinary tract infection in infancy and early childhood. E. Afri. Med. J. 50:514-520.

Alausa KO, Onile BA (1984). The epidemiological pattern of bacterial septicaemia at the University College Hospital, Ibadan. Nig Med. J. 14: 55-62.

Anochie IC, Nkanginieme KEO, Eke FU (2001). The influence of instruction about the method of urine collections and storage on the prevalence of urinary tract infection. Nig. J. Paediatr. 28(2): 39-42.

Bailey RR (1992). Urinary tract infection. In Westherall O.J. Ledingham. JGG and Warrell, D.A. (Eds). Oxford textbook of Medicine. 3rd edn Oxford; Oxford University Oress and Electron Publishing BV Section 6-7.

Bauer AW, Kirby MM, Sherris JC, Turch M (1996). Antibiotics susceptibility testing by standardized single disc method. Am. J. Clin. Path. 36: 493-496.

Bello AB, Onile BA (1998). Urinary tract infection among children. Nig Med Pract. 15 (3): 43-44.

Bishara J, Leibovic L, Huniner D, Drucker M, Samra Z, Konisberger H, Fitlik S (1997). Five years prospective study of bacteraemic urinary tract infection in a single institution. Evr. J. Clin . Microbiol. Infect. Dis. 16 (8): 563-567.

Christiaens TH, Heytens S, Verichraegen G, DeMeyers, DeMaeseneer J (1998). Which bacteria are found among Belgian women with uncomplicated urinary tract infections in primary health care and what is their sensitivity pattern anno 95-96 Act. Clin. Belg. 53 (3) 184-188.

Goldraichi NP, Manfroi A (2003). Febrile urinary infection. Escherichia coli susceptibly to oral antimicrobials Paediatr. Nephrol 17 (3): 173-176.

Gupta K, Hooton TM, Webbe CL, Stamm WE (1999). The prevalence of antimicrobial resistance among uropathogens causing actor uncomplicated cystitis in young women. Int. J. Antimicrob Agents 11 (3-6): 305-308.

Hooton TM, Stamm WE (1997). Diagnosis and treatment of uncomplicated urinary tract infection. Infect. Dis. Clin. North Am. 11: 551-581.

Karaou KM, Hanna A (1981). An epidemiological study of urinary tract infections in Beighazi, Libya. J. Hyg. Epidem. Microbiol. Immu. 25: 277

Lipsky BA (1990). Urinary tract infection in men: Epidemiology, pathophysiology, diagnosis and treatment. Ann. Inter. Med. 110: 138-150.

Mond MC, Gruneberg RN, Smellie JM (1970). A study of childhood urinary tract infection in general practice. Br. Med. J. 1: 602-605.

Morton KE, Lawande R (1982). Frequency and clinical features of urinary tract infection in pediatric outpatients in Nigeria. Ann. Trop. Paediatr. 2: 113-117.

National Institutes of Health (1999). The National Kidney and Urologic Diseases Advisory Board 1999. Long Range Plan-window on the 21st Century Publication No. 99: 583, Nite Bethesda, MD.

Okafor HV, Okoro BA, Ibe BC (1993). Prevalence of asymptomatic bacteriuria among nursery school children. Nig. J. Paediatr. 20: 84-88.

Olowu WA (1996). Symptomatic bacteriuria in children. Nig. Med Pract. 27: 76-80.

Olowu WA, Oyetunji TG (2003). Nosocomial significant bacteriuria prevalence and pattern of bacterial pathogens among children hospitalized for non-infective urinary tract disorders. West Afr. J. Med. 22 (1): 72-75.

Omar EE, ElHaj AJ (1992). Urinary tract infections in school children in Saudi Arabia. Med. Dig. 18: 3-7.

Prescott L, Harley J, Klein JO (2002). Microbiolgy 5th Ed. MacGraw Hill Publishers. pp. 808-823.

Resih O, Ashkenazi S, Naor N, Samra Z, Merlob P (1993). An outbreak of multiresistant *Klebsiella* in a neonatal intensive care unit. J. Hosp. Infect. 25(4): 287-291.

Ross JH (1994). The evaluation and management of vesicoureteral reflux. Semin. Nephrol. 14: 523-530.

Rudolph AM, Hoffman JE, Rodolph CD (1996). Rudolph's Paediatrics. Prentice Hall International. pp. 388-389.

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