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ASYMPTOMATIC AND SYMPTOMATIC URINARY TRACT INFECTION IN A NIGERIAN COMMUNITY

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ABSTRACT

The prevalence of urinary tract infection in relation to proteinuria and glucosuria and other renal indices was assessed among patients attending some outpatient clinics in Abeokuta, Ogun State, Nigeria. Of the 225 urine samples examined, the overall prevalence of urinary tract infection was 52% and there was no significant difference in the rate of infection between the age groups (P = 0.966). Females were significantly more infected than males (P ≤ 0.0001). Also there was significant difference between urinary tract infection and urine protein (P ≤ 0.0001) but not with urine glucose (P = 0.578). There was no significant different between urinary tract infection and both urea and creatinine (P = 0.628). *Escherichia coli* (28%) was the most frequently isolated microorganism from the urinary tract infections followed by *Klebsiella pneumoniae* (16%) and *Pseudomonas aeruginosa* (8%). There was significant difference between the isolates and susceptible antimicrobial drugs, ofloxacin (P ≤ 0.0001), nitrofurantoin (P ≤ 0.0001), ciproffloxacin (P ≤ 0.0001) and gentamicin (P ≤ 0.0001) but not with ampicillin (P = 0.153).

Key words: urinary tract infection, proteinuria, glucosuria, renal indices

INTRODUCTION

Urinary tract infection can be separated into asymptomatic and symptomatic cases based on the pathogenesis of infection and it is one of the major diseases that affect people of all age groups and sexes (Ojo *et al.*, 2004). Urinary tract infections can be categorized as descending and ascending (Kumamoto *et al.*, 1986). The pathogens spread from another infected body site to the kidneys down along the ureter to the bladder and such descending urinary tract infections cause severe kidney infection, a condition known as pyelonephritis. On the other hand, infections, which are confined to the urethral or the bladder are ascending and referred to as uretitis or cystitis respectively (Azubike *et al.*, 1994).

The diagnosis of urinary tract infection is usually confirmed by microscopy, culture and biochemical assays of properly collected urine samples. The treatment of individual that is infected is based on the antibiotic susceptibility patterns to the bacteria isolated. The bacteriology of urinary tract infections have been shown to be implicated with the presence of gram positive cocci such as *Staphylococci* and gram-negative organisms like *Escherichia*, *Kleb-*

siella, *Proteus* and *Pseudomonas* (Onyemenem and Ekweozor, 1996).

This study examined the prevalence of asymptomatic and symptomatic urinary tract infections especially in relation to urine protein (proteinuria) and glucose (glucosuria) and other renal indices. The study was also aimed at identifying bacteria pathogens, determining antimicrobial susceptibility patterns and thereby suggesting appropriate chemotherapeutic agents for use by infected patients in our studied locality.

MATERIALS AND METHODS

The study was conducted in Abeokuta, the capital city of Ogun State, Nigeria from December 2005 to June 2006 among patients attending outpatient clinic at Sacred Heart Hospital, Lantoro, Olukoye Ransome Kuti Community Hospital, Asero and State General Hospital, Ijaiye.

Two hundred and twenty-five (225) clean -catch midstream urine samples were collected from each patient into a sterile screw capped plastic containers. Ten ml of each urine sample was centrifuged at 2000 rpm for 5 minutes, the supernatant discarded and the sediment examined microscopically with high power objective (x 100) for red blood cells (RBC), white blood cells (WBC), bacteria, parasites, casts and epithelial cells. Urine protein and glucose were screened using reagent strips (ACON Laboratories inc, San Diego, U.S.A.). Each urine sample was streaked with a sterilized platinum wire loop on MacConkey and Nutrient agar plates. Representative of growing colonies were picked with a wire loop and pure cultures were made with repeated streaking. Resulting cultures obtained were used for biochemical tests aimed at identifying the bacteria isolates. Isolates were particularly subjected to Gram staining, urease, methyl-red, oxidative-fermentation and Quellung reactions (Davidsohn and Henry, 1974).

The Kirby-Bauer antibiotic susceptibility disk diffusion technique was used for sensitivity test (Kirby *et al.*, 1996). The multi disc used contained the following antibiotics: Ampicillin (AMP) – 25mcg; Gentamicin (GEN) – 10mcg; Nitrofurantoin (NIT) – 200mcg; Cotrimoxazole (COT) – 50mcg; Ofloxacin (OFX) – 10mcg; Cefuroxime (CER) – 30mcg; Cephalexin (CEPH) – 25mcg; Tetracycline (TET) – 50mcg.

Venous blood was obtained from the antecubital veins by means of a sterile needle and syringe, transferred into a plain sample tube with no anticoagulant and allowed to clot. The tube was then centrifuged at 2000 rpm for 5 minutes to obtain blood serum. Spectrophotometric assay of urea and creatinine were respectively carried out by the Oxime method and Jaffe reactions (Bauer *et al.*, 1974).

Data were entered and analysed using SPSS version 10 packages. Simple frequency tables were obtained for selected variables in the study. Relevant chi-square statistics were computed to accompany each cross tabulation.

RESULTS

Of the two hundred and twenty-five assymptomatic and symptomatic patients were investigated in this study, patients aged 1 – 5 years constituted 32 (14.2%) while those aged 16 – 30 years, 31 – 45 years, 40 – 60 years and 61 years above were 61 (27.1%), 80 (35.6%), 45 (20.0%) and 7 (3.1%), respectively. One hundred and five (105), i.e., 46.7% were male and 120 (53.3%) female patients. The overall prevalence of urinary tract infection in this study was 117 (52.0%). The infection within the age groups is presented in Table 1. It could be seen that 17 (7.6%), 30 (13.3%), 43 (19.1%), 24 (10.7%) and 3 (1.3%) had urinary tract infections in the age groups 1 – 15, 16 – 30, 31 – 45, 46 – 60 and above 61 years respectively. The computed Chi-square statistic for the test of no association between age group and urinary tract infection gave a value of 0.58 and statistically insignificant at less than 1% level and thus the null hypothesis of no association is accepted.

The intensity of urinary tract infection within sex presented in Table 2 shows that 68 (30.2%) of the females and 49 (21.8%) of males had urinary tract infections. The Chi-square computed for the test of no association between urinary tract infection and sex had a value of 12.85 and statistically significant at less than 1% level and, therefore, the null hypothesis of no association is rejected.

The cross tabulation between urinary tract infection and urine protein/urine glucose of the patient examined in Table 3 showed that 105 (46.7%) and 24 (10.7%) of the samples had urine protein and glucose, respectively. The computed Chi-square statistics for the test of no association between urinary tract infection and urine protein gave a value of 80.73 and statically significant at less than 1% level which shows that the null hypothesis of no association is rejected. Also the computed statistic Chi-square statistics for the test of no association between urinary tract infection and urine glucose had a value of 0.31 and statistically insignificant at less than 1% level and thus the null hypothesis of no association is accepted.

The cross-tabulation between urinary tract infection and blood urea/creatinine of the patients examined in Table 4 showed that 95 (42.2%) of the patients with urinary tract infections had normal blood urea (15 – 38 mg/dL) and creatinine (0.9 – 1.5 mg/dL); 10 (4.4%) and 12 (5.3%) had extremely elevated values. The computed Chi-square statistic for the test of no association between urinary tract infection and blood urea/creatinine gave same values of 0.93 and was statistically insignificant at less than 1% level. Thus, the null hypothesis of no association is accepted in each case.

The frequency distribution of bacteria isolates associated with urinary tract infections is shown in Figure 1. *Escherichia coli* was highest in prevalence followed by *Klebsiella pneumoniae* and *Pseudomonas aernginosa*.

Table 5 shows the antibiotic sensitivity pattern of various isolates from infected urine samples. All the isolates showed complete resistance to antibiotics, cotrimoxazole, cefuroxime, cephalexin and tetracycline. Ampicillin showed very low effectiveness to the isolates (less than 15%). Ofloxacin, nitrofurantoin, ciprofoxacin and gentamicin showed excellent antimicrobial activities to the isolates in that order.

DISCUSSION

The overall prevalence of urinary tract infection in this study was 52% with the highest infection in the age group 16 – 30 years (19.1%) between the age group and infection. This result agrees with the work of Kumamoto *et al.* (1999). Females were significantly more infected than males. This is in agreement with previous reports from other parts of the world (Ameil *et al.*, 1973; Roberts *et al.*, 1983; Hellstrum *et al.*, 1991; Wammanda *et al.*, 2000). The higher prevalence rate recorded in females could be due the female anatomy such as short urethral as well as the closeness of vagina and anus which favours contamination of the vagina by intestinal flora in prevailing poor hygiene. Also, the spread of normal flora in faecal materials from the anus to the vagina from where the bladder is infected is as a result of poor anal cleaning in the study environment (Azubike *et al.*, 1994) which could be responsible for the observed results in female urine samples.

The study showed a strong association between urine protein dipstic and urinary tract infection, however there is no significant difference between glucosuria and urinary tract infection. Similar findings had also been reported in various studies (Perry *et al.*, 1982; Goldsmith and Campos, 1990; Le Jeune *et al.*, 1991; Wammanda *et al.*, 2000). The proteinuria detected by dipstic is rapid screening test and does not require highly trained personnel for the diagnosis of urinary tract infection especially in the rural communities with very little or no diagnostic facilities. Generally, elevated blood urea and creatinine is indicative of renal malfuntion (Davidsohn and Henry, 1974). In this study there is no significant difference between both urea and creatinine blood levels and urinary tract infection.

Of the bacteria species recovered from the urine samples, *Escherichia coli* was the most abundant followed by *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. This result contrast the report of Azubike *et al.* (1994) but agrees with most other workers (Svanberg-Eden and Cindo, 1979; Rotimi, 1984; Ritu *et al.*, 1986; Wammanda *et al.*, 2000). There was significant difference between most of the isolates and sensitive antimicrobial drugs (ofloxacin, nitrofurantoin, ciprofoxacin and gentamicin) except ampicillin. Ampicillin showed very low effectiveness to the isolates which may be due to frequent misuse of the antibiotic in Nigeria (Okonofua *et al.*, 1989). The Ofloxacin which was the most sensitive to isolates (80%) and nitrofurantoin which was the next effective drug (6.4%) are recommended to be used with caution because of their potential to cause haemolytic anaemia in patients with glucose-6-phosphate dehydrogenase deficiency (Amon *et al.*, 1972; Davison, 1984).

Table 1: Distribution of urinary tract infection by age

Age (Years)	Urinary Tract Infection		Row Total N(%)
	Positive N(%)	Negative N(%)	
1 – 15	17 (7.6)	15 (6.7)	32 (14.2)
16 – 30	43 (19.1)	37 (16.4)	80 (35.6)
31 – 45	30 (13.3)	31 (13.8)	61 (27.1)
46 – 60	24 (10.7)	21 (9.3)	45 (20.0)
> 61	3 (1.3)	4 (1.8)	7 (3.1)
Total	117 (52.0)	108 (48.0)	225 (100)

Table 2: Distribution of urinary tract infection by sex

Sex	Urinary Tract Infection		Row Total N(%)
	N(%) Positive	N(%) Negative	
Female	68 (30.2)	105 (46.7)	32 (14.2)
Male	49 (21.8)	120 (53.3)	80 (35.6)
Total	117 (52.0)	225 (100)	61 (27.1)

Table 3: Urinary tract infection in relation to urine protein and urine glucose

Urinary Tract Infection	Urine Protein		Urine Glucose	
	Positive N(%)	Negative N(%)	Positive N(%)	Negative N(%)
Present	105 (46.7)	12 (5.3)	24 (10.7)	93 (41.3)
Absent	34 (15.1)	74 (32.9)	19 (8.4)	89 (39.6)
Total	139 (61.8)	86 (38.2)	43 (19.1)	186 (80.9)

Table 4: Urinary tract infection in relation to blood urea and creatinine

Blood urea Blood creatinine (*) mg/dL	Urinary tract infection		Row total N(%)
	Positive N(%)	Negative N(%)	
13 – 38 (0.9 – 1.5)*	95 (42.2)	82 (36.4)	117 (78.7)
39 – 60 (1.6 – 2.7)*	10 (4.4)	12 (5.3)	22 (9.8)
61 – 120 (2.8 – 6.0)*	12 (5.3)	14 (6.2)	26 (11.6)
Total	117 (52.0)	108 (48.0)	225 (100)

Values in ( )* refer to blood creatinine in mg/dL

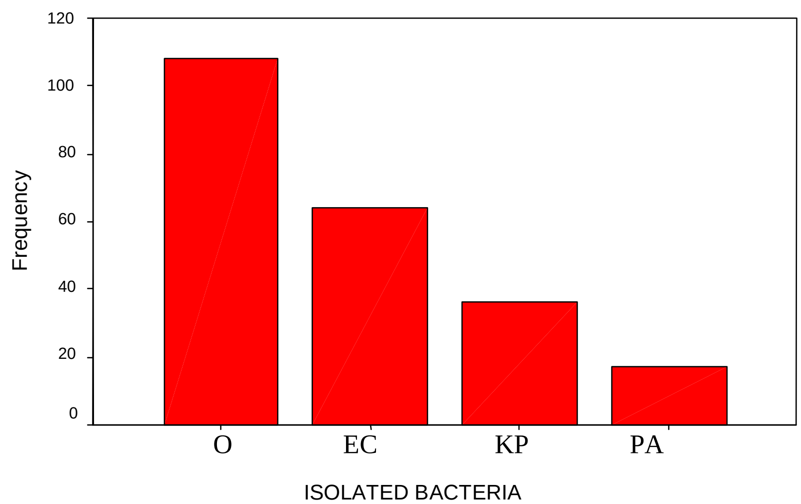

Figure 1: Frequency distribution of bacteria isolates associated with the urinary tract infection

Table 5: Antibiotic sensitivity pattern of bacteria isolates

Bacteria	Total no. of isolates	Frequency distribution of antibiotic sensitivity								
		NIT	FX	GEN	AMP	CIP	COT	CER	CEPH	TET
EC	64	39	53	25	8	25	0	0	0	0
KP	36	17	26	13	4	16	0	0	0	0
PA	17	9	15	5	2	6	0	0	0	0

EC = *Escherichia coli*
KP = *Klebsiella pneumoniae*
PA = *Pseudomonas aeruginosa*

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