

SJMLS-3(4)-013

Prevalence of Uropathogens in Zaria, Kaduna State, NigeriaIgwe J.C.^{1*}, Kachalla M.², Bolaji R.O.², Onaolapo J.A.², Ehnimidu J.O.², Olayinka, B.O.², Durowaye, M.T.³

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Abstract

Urinary tract infections that erupt as a result of microbial presence and growth in the urinary tract accounts for significant annual hospital visit in Nigeria, creating gross economic burden on the populace. This study evaluated the prevalence of uropathogens in 4 hospitals using simple random sampling method for the period of 6 months (April – September, 2015) in Zaria, Nigeria. The result showed that 26.5% (795) of the total samples submitted (3003) for urinalysis had uropathogens ranging from *E. coli* (57.6%), *Klebsiella spp.* (19%), *Staph. spp.* (9.2%), *Candida spp.* (5.3%), *Proteus mirabilis* (3.5%), *Streptococci spp.* (2.2%), *Pseudomonas spp.* (1.9%) to *Citrobacter spp.* (1.3%). High percentage of uropathogens were observed in female patients (71.2%) compared to their male counterpart (28.8%) and age group 18-44years had the highest incidence (73.7%) followed by the elderly \geq 45years (17.6%), while the toddlers (age group 0-5 years) and the teens (6-17 years) had the least incidence (5.3% and 3.7% respectively). This study showed that *E. coli* is the most common bacteria associated with UTI and the possibility of other clinical pathogenic organisms manifesting in UTI patients are possible. Therefore, rapid microbial identification techniques, antibiotic surveillance and management of UTI are recommended in the management of UTIs in order to curb the widespread of resistance traits among uropathogens in Zaria, Nigeria.

Keywords: UTI, uropathogens, Zaria, Kaduna State, Nigeria

Introduction

Urinary tract infection (UTI) erupt as a result of displacement of the normal flora of the gastrointestinal tract by prolonged administration of antibiotics or transient organisms emerging from the environment or medical instruments (invasive catheter), which lead to microbial influx and colonization of the urinary tract (Isa *et al.*, 2013). Arias (2008) suggested that UTI in pregnant women are caused by organisms from the normal vaginal, perineal, and faecal flora. Such organisms include *Escherichia coli*, *Staphylococcus aureus*, *Staphylococcus faecalis*, *Proteus mirabilis*, *Klebsiella* species, and *Streptococcus* species amongst others (Onoh *et al.*, 2013). UTI accounts for one of the most common bacterial infections with enormous economic burden for which medical intervention is sought every day in the hospitals. Clinical description of UTI ranges from asymptomatic bacteriuria to severe kidney damage and sepsis with significant bacteria growth in the urine \geq 10⁵CFU/mL (Brian and Sarah, 2005; Tanagho and Meaninch, 2004). The infection is characterized by symptoms such as painful sensation, cloudy, dark, or bloody or foul-smelling urine, pain in the back or side below the ribs, fatigue, shaky, weak and muscle aches, abdominal pain, fever, vomiting, pyuria, haematuria and neonatal jaundice (Reddy, 2006). Demographic factors like increase in age, gender, poor socioeconomic status, sickle cell tract, high parity, poor perineal hygiene, history of recurrent UTI, diabetes mellitus, neurogenic bladder retention, anatomic or functional urinary tract abnormality, and increased frequency of sexual activities have

been highlighted as major causes of UTI occurrence in different geographical location (Reddy, 2006; Schieve *et al.*, 1994), as different symptoms and signs may be observed among different age groups (Nadi *et al.*, 2006). In Nigeria the prevalent rate of UTI varies from 11.03% among the elderly in Benin (Richead *et al.*, 2010), 3% in symptomatic pregnant woman in Abakaliki (Onoh *et al.*, 2013) and 39.69% in Okada community with female having the highest occurrence than their male counterpart. In pregnancy, UTI accounts for one of the significant causes of perinatal and maternal morbidity and mortality (Onoh *et al.*, 2013). Predisposing determinants of high prevalence of UTI in pregnancy include hormone induced ureteral dilatation, urinary stasis, reduced immune function, and presence of vesicoureteric reflux (Addo, 2002). Although *E. coli* has been reported to be the predominant isolate causing urinary tract infection, few authors have reported changing patterns in the prevalence of uropathogens. The aim of this study was to establish the prevalence and predominant isolate causing urinary tract infection in Zaria, Nigeria and the demographic factors influencing it.

Methodology

Sample Collection

This hospital-based cross-sectional study was conducted by reviewing urine culture records for isolated uropathogens for the period of 6 months (April – September, 2014) using 4 randomly selected hospitals in Zaria, Nigeria. The hospitals reviewed include: Ahmadu Bello University Teaching Hospital, Shika, Ahmadu Bello University Sick Bay, St. Luke Anglican Hospital, Wusasa and Hajiya Gambo Sawaba General Hospital, Kofan-Gayan.

Ethical Approval

Ethical approval was obtained from the Ethical

Committee of the Ahmadu Bello University Teaching Hospital, Shika, Zaria.

Results/Discussion

This result showed the occurrence of uropathogens in urine samples cultured in 4 different hospitals in Zaria, Nigeria. The result showed that *E. coli*, *Staph. spp.* and *Klebsiella spp.* had the highest occurrence rate in the hospitals sampled (Table 1). This study concurs with previous reports by Bankole *et al.* (2011) in Okada, Edo State; Isa *et al.* (2013) in Maiduguri and Onoh *et al.* (2013) in Abakaliki who reported that *E. coli* and *Staph. spp.* are the predominant uropathogens in both clinical and community samples. Our finding is however at variance with report by Ehinmidu (2003) who reported that *Pseudomonas aeruginosa* and *Staph. aureus* followed by *E. coli* as the predominant uropathogens in Zaria. The high prevalence of *E. coli* in UTI observed in this study might be associated with the ability of some extra-intestinal pathogenic *E. coli* to adapt, colonize, persist in adhesion to urinary tract and also acquire virulent characteristics with time compared to other uropathogens (Justyna *et al.*, 2012; Mohammad, 2010). We observed a higher number of uropathogens among subjects seen at ABUTH compared to other hospitals. This observation might be associated with the population of patients attending the hospital, as it stands as the biggest Tertiary hospital in the North Western part of Nigeria and the fact that patients from various part of the country regularly visit the hospital for medical care. This study showed that uropathogens, whose pathogenicity have been implicated in cystitis and pyelonephritis, and other infectious complications that could result to acute renal failure in healthy individuals as well as in renal transplant patients have been isolated from UTI patients in Zaria, Nigeria.

Table 1: Incidence of Uropathogens in Selected Hospitals in Zaria.

S/ N	Hospitals (n=4)	Uropathogens								Sum Total
		<i>E. coli</i>	<i>Klebsiella spp.</i>	<i>Staph. spp.</i>	<i>Proteus spp.</i>	<i>Pseudomonas spp.</i>	<i>Candida spp.</i>	<i>Strep. spp.</i>	<i>Citrobacter spp.</i>	
1	ABUTH	326	28	131	19	11	29	0	8	552
2	ABUSB	78	8	12	6	4	6	0	2	116
3	SLAH	19	13	0	0	0	2	13	0	47
4	HGSGH	35	24	8	3	0	5	5	0	80
Total		458	73	151	28	15	42	18	10	795

Key: ABUTH = Ahmadu Bello University Teaching Hospital, Shika, ABUSB = Ahmadu Bello University Sick Bay, SLAH = St. Luke Anglican Hospital, Wusasa and HGSGH = Hajiya Gambo Sawaba General Hospital, Kofan-Gayan.

The prevalence of uropathogen in Zaria (26.5%) as observed in this study (Table 1) was less than that reported earlier (30.8%) by Pankaj *et al.* (2012) in Nepal and Bankole *et al.* (2011) in Okoda, Edo State who reported a prevalence of 39.69%. Our observed prevalence is however higher than the 6.1% prevalence reported by Bigwan and Elijah (2013) in Jos, Plateau State, Nigeria. This showed that the prevalence of uropathogens varies from one geographical location to another.

The prevalence of *E. coli* (57.6%) was observed to be the highest among the uropathogens evaluated in Zaria, Nigeria followed by *Staph. spp.* (19%) and *Klebsiella spp.* (9.2%) (Figure 1). Our finding is in agreement with previous report

by Onoh *et al.* (2013) who reported a prevalence of 50.8% for *E. coli* and 20.6% for *Staph. aureus* among symptomatic pregnant women in Abakaliki. Previous report in Zaria among asymptomatic pregnant women indicated that *Staph. spp.* (25.4%) and *E. coli* (16.8%) were the most prevalent (Bolaji *et al.*, 2013). The work of Moges *et al.* (2014) also support the high prevalence of *E. coli*, *Staph. spp.* and *Klebsiella spp.* observed in this study. The presence of other organisms like *Proteus spp.*, *Pseudomonans spp.*, *Candida spp.*, *Streptococcus spp.* and *Citrobacter spp.* observed in this study as major causes of UTI (Figure 1) have also been reported by other studies (Moges *et al.*, 2014; Bolaji *et al.*, 2013; Pankaj *et al.*, 2012).

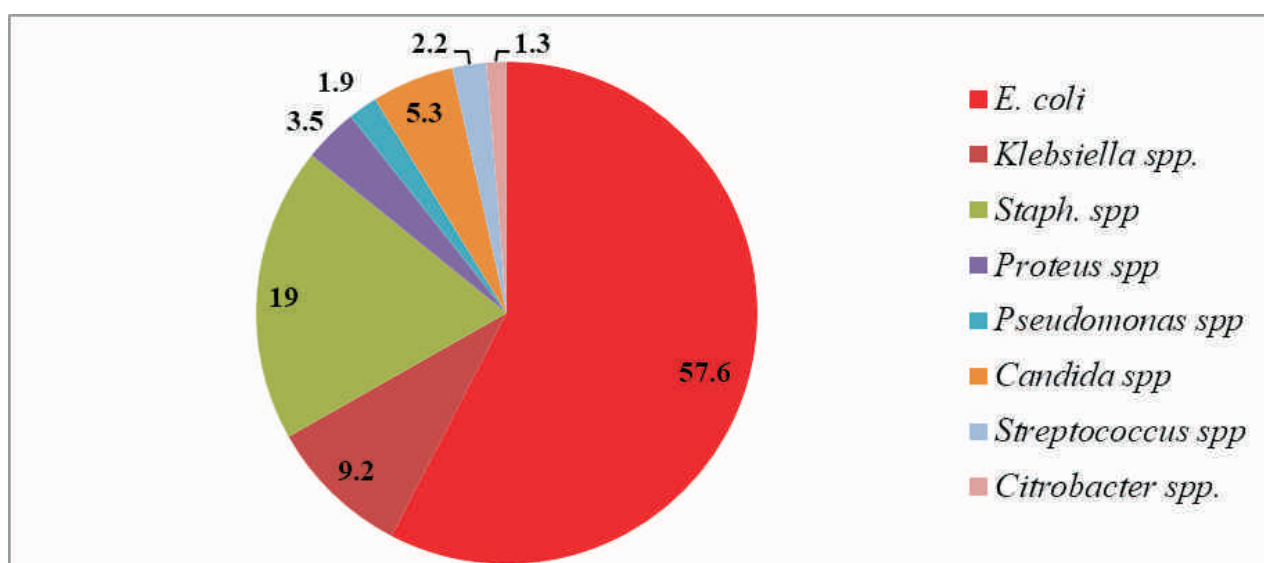


Figure 1: Percentage Prevalence of Uropathogens in Zaria, Nigeria.

Based on gender, female (71.2%) were observed to have a higher prevalence of uropathogens compared to their male counterpart (28.8%) (Table 2). This might be attributed to the physiology of women shorter urethra and its proximity to the anal opening and vaginal introitus (Hooton, *et al.*, 1999). This observation that UTI affect more women than men is in agreement with previous reports (Bigwan and Elijah, 2013; Bankole *et al.*, 2011).

Table 2: Percentages of Gender Susceptibility to Urinary Tract Infection

Hospitals (n = 4)	Gender		Sum Total
	Male	Female	
ABUTH	168	384	552
ABUSB	23	93	116
SLAH	18	29	47
HGSGH	20	60	80
Total	229	566	795
Percentages (%)	28.8	71.2	100

Key: ABUTH = Ahmadu Bello University Teaching Hospital, Shika, ABUSB = Ahmadu Bello University Sick Bay, SLAH = St. Luke Anglican Hospital, Wusasa and HGSGH = Hajiya Gambo Sawaba General Hospital, Kofan-Gayan, n = number of hospitals sampled.

Age distribution was also observed in this study. Subjects in the age group 18-44years were observed to have the highest prevalence (73.7%) followed by the elderly (17.6%) and toddlers (5.3%) while the teens (3.7) had the least prevalence. The high rate of UTI infection within the sexually active age (18-44years) might be associated with sexual activity of vaginal intercourse, level of hygiene, spermicide, diaphragm, condom misuse, illiteracy and honeymoon cystitis (Ehinmidu, 2003; Hooton *et al.*, 1996; Foxman and Chi, 1990). The reduction observed between the prevalence of toddlers and teens agrees with the work of Brian and Sarah (2005) who observed that UTI tend to decrease in children with increase in age. Also, our finding is also in agreement with the report of NIDDKD (2011) that throughout childhood, the risk of

having a UTI is approximately 2% for boys and 8% for girls. In children, chronic UTI have been associated with kidney scars, poor kidney growth, poor kidney function, high blood pressure, and other problems (NIDDKD, 2011). While the elderly patients were the second most affected groups. This finding might be as a result of atypical clinical presentation and many common urinary symptoms due to weakening of the muscles of the bladder, which leads to more urine being retained in the bladder (poor bladder emptying and incontinence) that accompanies aging (Sita *et al.*, 2006). The effects of neurological disorder, hepatic and cardiac conditions have been highlighted to play a role in UTI reoccurrence in elderly (Shortliffe and McCue, 2002).

Table 3: Impact of Age on Urinary Tract Infection

Hospitals (n = 4)	Ages in Years				ANR
	0-5	6-17	18-44	≥45	
ABUTH	31	12	380	96	16
ABUSB	4	5	86	24	2
SLAH	1	3	33	8	5
HGSGH	6	9	58	12	4
Total	42	29	557	140	27
Percentages (%)	5.3	3.7	70	17.6	3.4

Key: ANR = ages not recorded, ABUTH = Ahmadu Bello University Teaching Hospital, Shika, ABUSB = Ahmadu Bello University Sick Bay, SLAH = St. Luke Anglican Hospital, Wusasa and HGSGH = Hajiya Gambo Sawaba General Hospital, Kofan-Gayan.

Conclusion/Recommendations

This study showed that *E. coli*, *Staph. spp* and *Klebsiella spp.* were the most common bacteria associated with UTI in Zaria, Kaduna State. Females and subjects within the age group 18-44years were more predisposed to UTI patients in Zaria, Nigeria. This study recommends the use of rapid microbial identification techniques, antibiotic surveillance and proper management of UTI in infected patients. It also suggests the need for increased efforts toward creating awareness among the people, for effective treatment, control and prevention of UTI in order to curb the wide spread of resistance traits among uropathogens.

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Citation: Igwe J.C., Kachalla M., Bolaji R.O., Onaolapo J.A., Ehnimidu J.O., Olayinka, B.O., Durowaye, M.T. Prevalence of Uropathogens in Zaria, Kaduna State, Nigeria. *Sokoto Journal of Medical Laboratory Science*; 3(4): 103 - 108.

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