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Evaluation and Prevalence of *Schistosoma haematobium* and Uropathogens in urinary tract infections among women attending Madonna University Teaching Hospital Elele, Rivers state

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Abstract

Urinary tract infections has a high incidence in females due to the female anatomy, which infects the urethra by contaminating the area that surrounds the rectum and spreading to the bladder. On the other hand, *Schistosoma haematobium* co-infection with the urinary tract is caused by active skin penetration of cercariae which migrates through the blood stream and eventually dwells in the blood vessels of the bladder. 150 urine samples of females attending Madonna University Teaching Hospital Elele, Rivers state were analyzed to determine the evaluation and prevalence of *Schistosoma haematobium* and Uropathogens in urinary tract infections amongst the women. Following microbiological examinations, it revealed that 135 cases out of the 150-study population were positive to urinary tract infections caused by some Uropathogens like *Escherichia coli* 72(53.3%), *Staphylococcus aureus* 43(31.9%), *Citrobacter freundii* 16(11.9%) and *Pseudomonas aeruginosa* 4(3%). Only 1(1.4%) case of *Schistosoma haematobium* infection was positive and as such, the participant was given albendazole tablet. Antibiotics susceptibility pattern showed a high sensitivity to ciprofloxacin, pefloxacin amongst others. Data was analyzed using SPSS version 26 package (in windows 7), and values were considered significant at $P < 0.05$. Most of the participants had access to potable water sources for their domestic usage as indicated in the study, this contributed to the minimal rate of the *Schistosoma haematobium* infection. Healthcare professionals should discuss the appropriate use of an antimicrobial medication with patients and discourage self-medications.

Keywords: Urinary Tract Infections, Co-infection, Uropathogens, *Schistosoma Haematobium*, Prevalence

Introduction

UTIs are also caused by the presence and growth of microorganisms in the urinary tracts, and are perhaps the single commonest bacterial infections of mankind (Lawani *et al*., 2015) [12]. Urinary tract infections (UTIs) are common bacterial infections in women, with half of all women experiencing at least one in their lifetime (Neupane *et al*., 2012) [17]. Although most UTIs are mild and can be easily treated with appropriate antibiotic treatment, although more severe infections can be destructive leading to bacteraemia, sepsis and death. 25-30% of the women affected, develop recurrent infections not related to any functional or anatomical abnormality of the urinary tract (Al-Badr and Al-Shaikh, 2013) [1]. UTIs can be classified as complicated or uncomplicated. Uncomplicated UTI is the most common type of infection and mainly occurs in the absence of functional or anatomical abnormalities within the urinary tract (Muharram *et al*., 2014) [15]. The complicated UTI occurs in the presence of an abnormal urinary tract that increases susceptibility to infection (Sheerin and Glover, 2019) [20]. Most UTIs in women are of acute uncomplicated cystitis which occur in women of reproductive age. Although acute uncomplicated cystitis may not be thought of as a serious condition, it affects the patient's quality of life by causing an estimated six days of discomfort (Lee *et al*., 2015) [13]. Risk factors specific to women for urinary tract infections include female anatomy. A woman has a shorter urethra than a man does, which shortens the distance that bacteria must migrate to reach the bladder (Nahla *et al*., 2019) [16]. The urinary tract consists of the organs that collects, stores urine and releases it from the body which include kidneys, ureter, bladder and urethra (Nileka and Sagar, 2015) [18]. The common etiologic agents of UTIs include *Escherichia coli, Klebsiella* spp, *Staphylococcus aureus*, *Pseudomonas* spp. and *Proteus* spp. (Flores-Mireles *et al*., 2015) [9]. Schistosomiasis also known as bilharziasis or snail fever is an infectious disease caused by parasitic worms of the genus

Schistosoma belonging to the class Trematoda (Moyo et al., 2016) [14]. There are three main species under the genus Schistosoma that can infect humans, and these are Schistosoma haematobium, Schistosoma mansoni and Schistosoma japonicum (Colley *et al*., 2014) [7]. The adult worms of this parasite dwells in blood vessels surrounding the bladder and genital tract of female, and the female worms lay eggs within the blood vessels, resulting into chronic granulomatous inflammation in urinary bladder, ureter, cervix, and vaginal wall (Kaiglová *et al*., 2020) [11]. The World Health Organization has renamed this disease urogenital schistosomiasis, this is because the urinary and genital tracts are almost always both affected with the presence of *Schistosoma haematobium* eggs in urine or genital tract (WHO, 2013) [21]. In a bid to isolate and identify the bacteria involved in the urinary tract infections, the study was aimed at the evaluation of prevalence of *Schistosoma haematobium* and Uropathogens in urinary tract infections among women attending Madonna University Hospital, Elele, Rivers State.

Materials and methods

The study was conducted on one hundred and fifty (150) women within the range of 18 to 52 years attending Madonna University Teaching Hospital, Elele, Rivers State. The Hospital is located in Elele, situated in the tropics of Southern part of Nigeria. It is located in latitude 5° 27° to 5° 3N and the longitude 6°57- 7°85E. Ethical permission was obtained from the ethical committee of Madonna University Teaching Hospital Elele, Rivers State. A total number of 150 questionnaires were designed using open ended questions to provide information such as age, occupation, education, marital status, environmental factors and gestational age (in pregnant women). Midstream urine samples (after proper guidance on collection) were obtained from each of the participants into sterilized screw capped containers and labelled properly with participant's code. To examine *Schistosoma haematobium* egg, the sedimentation method as described by Cheesbrough was used and the presence of terminal spine eggs, which is characteristic of *Schistosoma haematobium* was confirmed and reported as positive. Urine culture methods were aseptically carried out using standard microbiology techniques as described by Cheesbrough (Cheesbrough, 2006) [6]. A sterile wire loop was used to transfer 0.1 ml of urine sample onto different media including CLED (cysteine lactose electrolyte deficient) agar, MacConkey agar and Nutrient agar following 24 hours of incubation at 37°C. After incubation, plates were examined for the growth of different microorganisms. Following subculture, plates were incubated for 24hours at 37°C and organisms examined and characterized based on morphology (shape, size, appearance, colour and texture), Gram staining reactions and some biochemical tests were performed to determine the presumptive isolates.

Molecular analysis

Molecular Identification of the presumptive isolates was further done at Nucleometrix Molecular Laboratory, Yenagoa, Bayelsa state. The physical (boiling) method of extraction was used for this study. 5mls of an overnight broth culture of the bacterial isolate in Luria Bertani (LB) was spun at 14000rpm for 3 minutes. The cells were re-suspended in 500µl of normal saline and heated at 95^0C for 20 minutes. The heated bacterial suspension was cooled on ice and spun for 3 minutes at 14000rpm. The supernatant containing the DNA was transferred to a 1.5ml microcentrifuge tube and stored at -20°C for other downstream reactions.

Statistical analysis

Data was entered and analyzed using SPSS version 26 package, ANOVA and Chi square. Frequency tables, figures and graph were obtained for selected variables in the study. Values were considered significant at $P < 0.05$

Results and discussions

Out of the 150 samples analyzed for the prevalence of *Schistosoma haematobium* and Uropathogens in urinary tract infections among the study population, 135 participants were positive to urinary tract infection caused by *Escherichia coli*, *Staphylococcus aureus*, *Citrobacter freundii* and *Pseudomonas aeruginosa*. The prevalence rates of the isolates were as follows; *E. coli* was confirmed to have the highest prevalence rate of 72(53.3 %), followed by *Staphylococcus aureus* 43(31.9%), *Citrobacter freundii* 16(11.9%) and *Pseudomonas aeruginosa* 4(3%) as seen in Table 1.

Table 1: Frequency of occurrence of Uropathogens isolated

Uropathogens	Frequency
Escherichia coli	72 (53.3%)
Staphylococcus aureus	43 (31.9%)
Citrobacter freundii	16 (11.9%)
Pseudomonas aeruginosa	4 (3%)

Table 2: Age distribution of the different Uropathogens isolated Number of Presumptive Bacteria Isolated

Age group (years)	*Escherichia coli* (%)	*Staphylococcus aureus* (%)	*Citrobacter freundii* (%)	*Pseudomonas aeruginosa* (%)	Total
18 – 22	13 (48.1)	10 (37)	4 (14.8)	0 (0)	27
23 –27	11 (39.3)	12 (42.9)	3 (10.7)	2 (7.1)	28
28 – 32	10 (45.5)	7 (31.8)	3 (13.6)	2 (9.1)	22
33 – 37	16 (66.7)	5 (20.8)	3 (12.5)	0 (0)	24
38 – 42	10 (62.5)	4 (25)	2 (12.5)	0 (0)	16
43 – 47	8 (66.7)	4 (33.3)	0 (0)	0 (0)	12
48 – 52	4 (66.7)	1 (16.7)	1 (16.7)	0 (0)	6
Total	72	43	16	4	135

$X^2 = 14.767$

Significant value =0.678

P-value (>0.05)

Only 1 out of the 135 samples was positive to *Schistosoma haematobium* co-infection with *E. coli* among the other isolates. The participant was given Zentel (albendazole) tablet as treatment for *Schistosoma haematobium* infection. Amongst the participants during the time of this study, 45

were pregnant, 32 were lactating mothers, 23 were post-partum mothers and 50 fell in the category between students and others (women with children) shows in table 4.

Table 3: Prevalence of *Schistosoma haematobium* co-infection with the uropathogens (*E. coli*)

Bacteria isolates	Positive (%)	Negative (%)	Total
E. coli	1 (1.4)	71 (98.6)	72
Staph. aureus	0 (0)	43 (100)	43
Citrobacter freundii	0 (0)	16 (100)	16
Pseudomonas aeruginosa	0 (0)	4 (100)	4
Total	1	134	135

Table 4: Describable features amongst the participants

Features	Number
Pregnant	45
Breastfeeding	32
Postpartum	23
None	50
Total	150

The study confirmed that most water sources in Elele town are Borehole, Rain and Packaged water; with borehole water being the commonest source of water for different activities amongst the participants within the area. Although about 4 participants reported river water as their drinking source. Ciprofloxacin, gentamycin, streptomycin and ampicillin were found to be most effective for the gram-negative organisms isolated in this study. While erythromycin and ofloxacin were found to be effective against *Staphylococcus aureus*. All the isolates showed resistance to nitrofurantoin. Widespread inappropriate use of antimicrobial agents in Nigeria is also due to the possibility of buying antibiotics from pharmacy stores with or without prescription; this is a significant contributing factor to the development of resistance to antimicrobial agents. The early treatment of urinary tract infection reduces the probability of complications in pregnant women which may be very dangerous to mother and the fetus. A survey in Nigeria examined 47 dams in areas hyper-endemic or moderately endemic for schistosomiasis. Of these dams, 20 had the requisite intermediate molluscan hosts, indicating a need for new large-scale surveys to determine the true prevalence and distribution of schistosomiasis in Nigeria (Ezeh *et al*., 2019) [8]. Government agencies from many countries have prioritized the control of neglected tropical diseases by exploiting breakpoints in their life cycles, such as the implementation of snail control and thorough improvements in sanitation and access to safe, clean water (Barsoum, 2013) [5]. *Escherichia coli* and *Schistosoma* spp. are the most commonly reported bacteria and parasites associated with UTIs in the country, especially southwest Nigeria (Ayoade *et al*., 2013) [4]. In nearby Sagamu, for example, (Alabi *et al*., 2018) [2] reported a prevalence rate of 23.9% while (Otajevwo and Amedu, 2015) [19], reported a prevalence rate of 86.6% in Benin City, Nigeria. A prevalence rate of 7% in pregnant women has been reported in Ethiopia (Alemu *et al*., 2012) [3], while in Canada the prevalence rate varies from 4%-7% (Harding *et al*., 2014) [10]. The microbial spectrum of uncomplicated UTIs in women consists mainly of *Escherichia coli* (75-95%). Occasionally, other species of *Enterobacteriaceae*, such as *Proteus mirabilis* and *Klebsiella pneumoniae*, and other bacteria, such as *Staphylococcus saprophyticus*, also cause infection (Harding *et al*., 2014) [10].

Conclusion

Urinary tract infections occur as a result of the invasion and colonization of the urinary tract by microbial organisms such as bacteria, viruses, yeasts and parasites. This study revealed that there lies an association between *Schistosoma haematobium* and *Escherichia coli* causing urinary tract infection amongst women. Most of the participants had access to clean potable water sources for their domestic usage as confirmed in this study, as this contributed to the high rate of the *Schistosoma haematobium* infection obtained in the research. Healthcare professionals should discuss the appropriate use of an antimicrobial medication with patients and discourage self-medications. Antimicrobial resistance by the pathogens can also be minimized if patients complete the recommended treatment course, and do not stop treatment as soon as their health condition improve. Availability and accessibility of potable water in the community, proper sanitation awareness and adequate healthcare facilities should be provided to people living in *Schistosoma haematobium* endemic areas.

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