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Antibiotic Susceptibility Pattern among Male Patients with Urinary Tract Infection in Special Treatment Centre, Nairobi County, Kenya.

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Keywords

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uropathogen

Abstract

The occurrence of urinary tract infections in men can be very serious although not very common. Antibiotic resistance is becoming a global concern and Kenya is no exception.
The aim and objective of the study was to investigate the causative bacteria and antibiotic susceptibility patterns among male patients with urinary tract infection visiting Special Treatment Centre, Nairobi County.
Method: A descriptive cross-sectional study design was adopted from January 2018 to March 2018. Three hundred and eighty four (384) participants were recruited into the study using systematic sampling technique using structured questioners. Clean morning midstream urine was then cultured on Cysteine-Lactose-Electrolyte Deficient (CLED) agar and blood agar medium as per the standard urine culture. Antibiotic sensitivity test was then done on Mueller-Hinton agar using Kirby-Bauer disk diffusion method according to CLSI guidelines. Appropriate biochemical tests were done to identify the isolated bacteria.
Results: The highest number of isolates was found to be *Escherichia coli* isolates (105) and the least was *Pseudomonas auroginosa* (12). Ofloxacin, 113(45.2) was found to be most effective antibiotic (x^2=18.2, p=0.01) and the least effective being Augmentin (x^2=1.56, p=0.811). Resistance was found to be high to Nitrofurantoin (65%) and least to Oflocaxin (13%).
Conclusion: Bacterial cultures and sensitivity should be done on all cases of UTI's to determine causative agents so as to guide clinicians in determining the most appropriate treatment. This will help in addressing cases of emerging multidrug resistance to the commonly used antibiotics. Follow-up of treated individuals to determine effectiveness of treatment would also help in addressing cases of failed treatment and prevention of resistance.

Introduction

Urinary Tract Infections (UTI) can cause serious health problems and affect millions of people annually (Elahe, 2015). Globally; there are 7 million outpatient visits, 1 million emergency department visits, and 100,000 in-patients annually, from symptomatic UTI (Foxman B. , 2002).

Urinary Tract Infections in men can be very serious when they occur even though they are not very common (Elahe, 2015). The presence of UTI's may differ with sex, age and certain predisposing factors like diabetes, anal intercourse, neurological disease, bladder dysfunction, prostrates Syndrome and immunocompromise (Hsueh, 2011). In men the number of new infections annually is lower than in women except infections found in catheterized patients and infants (Noor, 2013).

Antibiotic resistance is becoming a global concern, Kenya is no exception. Antibiotic resistance can occur naturally or because of misuse of the antibiotics. Misuse and overuse are the leading causes (WHO, 2018). In Kenya; antibiotics can be bought without a prescription from a qualified doctor. This is usually the leading cause of misuse of antibiotics. Lack of proper and correct information about antibiotics can also add to the misuse of antibiotics.

Not much has been studied on the antibiotic resistance pattern of community acquired UTI Pathogens (Goldstein, 2010). These pathogens and the antibiotic sensitivity have been taking different trends over the years both in the community and hospital acquired infections (Manges, 2006), (Kahan, 2006). There are also few studies carried out on the causes and antibiotic sensitivity patterns of community acquired UTI's in Kenya among males and more so in special treatment center, Nairobi. It is for this reason that this study was carried out to investigate antibiotic susceptibility pattern among male patients with urinary tract infection in Special Treatment Centre, Nairobi County, Kenya.

Materials and Methods

This cross –sectional study was carried out in special treatment Centre, Nairobi, Kenya. The study utilized 384 urine samples collected from male patients visiting STC casino from January 2018 to march 2018. Clean midstream urine was collected from male patients presenting with symptoms of UTI between 8.00am and 10.00pm. The urine samples were analysed by use of CHEM-LABS urine test strip. This analysis was conducted within the first two hours of sample collection. Analysis was done by immersing the disposable multistick in urine, making sure that urine touches all the parameter. Any positive result for leukocytes, proteins and nitrites was noted and taken for culture. (Monica. 2006)

Isolation and identification of uropathogens:

Sterile 4.0 mm platinum wired calibrated loop was used to inoculate a volume of 0.001 mL of urine. The urine was cultured on Cystein-Lactose-Electrolyte Deficient (CLED) agar and blood agar medium and incubated at 37^0C for 24h. A urine sample was considered UTI positive if it had five or more white blood cells per HPF and a colony count of 10^4 CFU/ml of single bacterium. Gram staining and appropriate biochemical tests were done to identify the isolates. Antibiotic sensitivity test was done on Mueller-Hinton agar (Oxoid, Hampshire, England) using Kirby-Bauer disk diffusion method (Bauer 1996) and interpreted using CLSI guidelines. The antibiotics used were Ofloxacin, cefaclor, Augmentine, cefuroxime, Minocycline, ciprofloxacin, Gentamicin, tetracycline, Nitrofurantion, Nalidixic acid.

E. coli ATCC 25922, *P.aeruginosa* ATCC 27853, *S. aureus* ATCC 29123, were used as standard strains.

Ethical clearance

Ethical clearance was obtained from Kenyatta University Ethical Review Committee (PKU 654/1734). Administrative approval was also sought from the Special Treatment Hospital before conducting the research. Each participant was given a written consent after introduction to the study by the principal investigator and the research assistants. Participation was voluntary and names of the respondents were not used on the sample container and questioner to ensure anonymity and confidentiality. Questionnaires were given unique identifiers/codes during data entry and analysis. All records were kept in a lockable cabinet for safety.

Results

Out of the 252 positive cases of UTI, the majority of participants were aged between 20-39 years 125 (50%). The least frequent age with UTI was 40 years and above (5.6%).

Table 1 Distribution of positive cases in male participants.

		Frequency	Percent	Cumulative Percent
Age	1-12 years	54	21.6	21.6
	13-19 years	26	10.4	32
	20-35 years	125	50	82
	36-55 years	31	12.4	94.4
	above 55 years	16	5.6	100
	Total	252	100	

Isolated Uropathogens

Out of the 252 samples, both the Gram negative and positive bacteria were isolated. One hundred and eighty seven187 (74.2%) Gram negative and bacteria Gram positives were 65 (25.8%).

Table 2: Distribution of Isolated Gram Positive and Gram Negative Bacteria.

Gram positive	**N**	**%**
S. saprophyticus	23	9.1
S. aureus	42	16.8
Gram negative		
E. coli	105	41.6
K. pneumoniae	50	19.8
P. mirabilis	20	7.9
P. auroginosa	12	4.7
	252	

A shown above in Table 3, the highest resistance shown by *Escherichia coli* to Nitrofurantoin was 59(56%) and 56(53.3%) to cefaclor. It was also sensitive to Ofloxacin 88(83.8) followed by 80(76.2) to cefuroxime. Out of the 50 *Klebsiella pneumoniae* isolates 45(90) were sensitive to Ofloxacin and highly resistant to nitrofurantoin 46(92).There were 12(4.7) *P. auroginosa* isolates and all of them were found to resist cefaclor 12(100) which was otherwise found to be very effective on all the 20(7.9) isolates of *P. mirabilis*. Under the gram positive isolates, there were 23(9.12) isolates of *S. saphrophyticus.* Most of them were sensitive to ofloxacin 20(86) and Gentamicin22 (96) While being resistant to Augmentine 20(86). *S. aureus* had 42(16) isolates, 40(95.2) being sensitive to ofloxacin and 36(85.7) being sensitive to cefuroxime.

Table 3: Antibiotic sensitivity pattern of uropathogens

Bacterial isolate	Number of isolates	patterns	Ofl	Nit	Ccl	Nal	Aug	Crx	Min	Cip	Gen
E. coli	105	S	88(838)	46(44)	49(46.6)	61(58)	61(58)	80(76.2)	78(74.2)	52(49.5)	64(60.9)
		R	17(16.1)	59(56)	56(53.3)	44(42)	44(42)	25(23.8)	27(25.8)	54(50.5)	41(39.1)
K.. pneumoniae	50	S	45(90)	4(8)	30(60)	30(60)	24(48)	38(76)	38(76)	17(34)	17(34)
		R	5(10)	46(92)	20(40)	20(40)	26(52)	12(24)	12(24)	33(66)	33(66)
P. mirabilis	20	S	16(80)	8(40)	20(100)	4(20)	9(45)	17(85)	3(15)	14(70)	18(40)
		R	4(20)	12(60)	0	16(80)	11(55)	3(15)	17(85)	6(30)	2(60)
Pseudomonas auroginosa	12	S	11(91.6)	2(17)	0	2(17)	4(33.3)	10(84)	11(91.6)	2(17)	11(91.6)
		R	1(8.4)	10(83)	12(100)	10(83)	8(66.6)	2(16)	1(8.4)	10(83)	1(8.4)
S. aureus	42	S	40(95.2)	21(50)	22(52.4)	18(42.9)	17(40.5)	36(85.7)	26(70)	24(57.1)	19(45.2)
		R	2(4.8)	20(50)	20(47.6)	2457.1)	25(59.5)	6(14.3)	16(30)	18(42.9)	23(73.6)
S. saprophyticus	23	S	20(95.2)	6(26)	11(48)	8(35)	3(14)	10(44)	21(91.3)	16(70)	22(96)
		R	3(4.8.)	17(74)	12(52)	15(65)	20(86)	13(56)	2(8.7)	7(30)	1(4)

Discussion

Six species of uropathogens were identified from the 252 positive urine cultures. The analysis showed that Gram negative bacteria occurred at a higher frequency 187(74.2%) than Gram positive 65 (25.8%). bacteria. Among the Gram positive, *S. aureus* was isolated most at 42(16.8%) followed by *S. saprophyticus* at 23 (9.12%). Amongst the Gram negative bacteria, *E. coli* had the highest number of isolates at 105(59.5), followed by *K. pneumoniae* at 50(19.8), *Proteus* at 20(7.9%) and *P. auruginosa* at 12 (4.7%). (Table 2) Overall, *E. coli* and *S. aureus* were highly isolated as the cause of UTI. The results were consistent with the findings of (Abdelraouf A. Elmanama, 2018) which revealed *Escherichia coli* as the most frequently isolated uropathogen. Similar findings were also found by (Noor, 2013) where *E. coli* was the most common isolate (70%) in the study they conducted followed by *Klebsiella pneumoniae* (11%). This shows that *E. coli* is the most common uropathogens causing UTI in the population. The second most common uropathogenic agent according to this research was *Klebsiella pneumoniae* 50 (19.8) which is also similar to the results of other studies that have been done in past by (Noor, 2013, Payam et al., 2010).

Resistance to antibiotics by the different bacterial species in this study was varied. *E. coli* isolates were resistant to most of the tested antibiotics (Table 3). The highest resistance was towards nitrofurantoin and cefaclor at 65% and 55.5% respectively, this despite cephalosporins being one of the most prescribed UTI treatments across the world (Saghir *et al.*, 2014), while ofloxacin presented the highest sensitivity at 87% (Table 3). Unlike most studies (Nimri L. 2010, Wiles *et al.*, 2008) *E. coli* was the most resistant of the isolated organisms presenting the highest percentage in multiple drug resistance (Table 3) which may be explained by the high number of *E. coli* isolates compared to the other isolates. In essence, all *E. coli* isolates were resistant to more than one of the tested antibiotics. The highest resistance was against nitrofurantoin and cefaclor at 65% and 55.5% respectively, this despite cephalosporins being one of the most prescribed UTI treatments across the world (Saghir *et al.*, 2014), while ofloxacin presented the highest sensitivity at 87% (Table 3).

The most commonly isolated Gram positive organisms was *S. aureus* at 42(16.6%) despite it being associated with hospitalized patients who have undergone intrusive procedures such as catheterization. Special treatment center being an outpatient facility, did not offer such procedures and this organism could only have been acquired from the community. In 1997, it was reported that up to 29% of individuals outside the hospital environment are colonized by Methicillin Resistant *S. aureus* (MRSA). This number has continued to grow since (EARSS 2008). This type of colonization is caused by strains of *S. aureus* different from those found in the hospital environment and are normally termed as community-associated MRSA (CA-MRSA). This uropathogen has appeared with high frequency in the community in individuals who have not been hospitalized or undergone medical procedures such catheterization, dialysis or surgery (Kuroda et al., 2005).

According to the literature, *P. aeruginosa* is more frequent in males than in females due to certain predisposing factors: including previous use of antimicrobials, previous interventions in the urinary tract and patients with neurogenic bladder (Tabibian *et al.*, 2008). Indeed, it is necessary for any empiric therapy to consider the clinical history of male patients, including recent hospitalization in order to determine whether the UTI is due to *P. aeruginosa* or not, and in such cases avoid the use of fluoroquinolone because (Rat *et al.*, 2005).

Conclusion

Studies done globally have indicated that antimicrobial resistance is become a big problem worsened by multi drug resistant strains of bacteria, making it difficult to properly treat patients with UTI. This is a worrying trend for the developing countries especially due to the high economic burden on the healthcare system in treating these infections. The comparatively high resistance of uropathogens isolates to commonly used antimicrobial depicted in this research should be seen as a concern to the management of UTIs. Therefore, routine sensitivity screening of antibiotics before prescription is suggested. Bacterial cultures and sensitivity should be done on all cases of UTI's to determine causative agents so as to guide clinicians in determining the most appropriate treatment. This will help in addressing cases of emerging multidrug resistance to the commonly used antibiotics and cut down on health care cost. Follow-up of treated individuals to determine effectiveness of treatment would also help in addressing cases of failed treatment and prevention of resistance.

Antibacterial sensitivity should be done on all isolated organisms. This will help in addressing cases of emerging resistance to the commonly used antibiotics. It will also allow health authorities to take remedial measures as soon as possible. Follow-up of treated individuals to determine effectiveness of treatment would also help in addressing cases of failed treatment and prevent spread of resistance.

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