Antibiotic Resistance Among Uropathogenic Escherichia Coli

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Abstract:

Background & Method: The study is conducted with an aim to study Antibiotic resistance among Uropathogenic Escherichia Coli, targeted both male and female outpatients and inpatients presenting with symptoms and signs of UTI which include dysuria, polyuria, fever, nausea, and flank pain were sampled for this study. This study is done with an aim to study Antibiotic resistance among Uropathogenic Escherichia Coli. Baseline demographic data including age, sex, level of education and risk factors such as catheterization, history of UTI, also out and in patients were also collected.

Result: Among the total 120 isolates, resistant to ≥2 drugs were recorded in 108 (90 %) of all uropathogens. Seventy seven (93.9 %) isolates of Gram-negative bacteria and 31(81.6 %) of Gram positive bacteria showed resistance to two or more drugs (Table 4). Resistance pattern of bacterial isolates to more than two antibiotics of patients (N = 120)

Conclusion: There is a need for continuous surveillance of antibiotic to the currently used antibiotics in management of urinary tract infections covering the entire Index Hospital . Index Hospital to enforce policies formulated by pharmacy and poison board to prevent misuse or underuse of antibiotics by giving prescription to only patients with results of culture and sensitivity and therefore treatment UTIs should be based on and sensitivity in order to limit multidrug resistance. Continuous follow up to provide an update of laboratory diagnosis of urinary tract infections in order to reduce multidrug resistance bacteria in UTI patients. Health care workers should enforce health education to patients in order to adhere to the treatment and thereby reducing drug resistance. v) Screening for resistance and identify modes of transmission.

Keywords: Antibiotic, resistance, Uropathogenic & Escherichia Coli.

Study Designed: cross-sectional study.

1. INTRODUCTION

Urine pass through the urethra allows the entry of uropathogens into the urinary tract initiating an inflammatory response, colonize urine in the urethra and if not washed out during urination

culminating into a bacterial infection. Due to their anatomical orientation: that is the short distance between the anus and vagina women are at a higher risk of getting UTIs.
 A second re-infection occurs in about 50 % of all women with a first UTI within six months . Bacteria establish infection in the urinary tract only after overcoming possible elimination by normal flora during micturation and innate host defense mechanism in the bladder. Only about 2-5 % of documented UTIs are acquired hematogenously and usually result from bacteremia caused by relatively virulent organisms such Salmonella spp. and Staphylococcus   aureus ([1]Karlowsky et al., 2002). Common symptoms of UTIs include burning sensation during urination, loss of bladder control, increased frequency of urination especially in small amounts, low back pain, cloudy and bloody or foul-smelling urine ([2]Onifade et al., 2011).

Multidrug resistance should be monitored worldwide and surveillance systems should be used to determine the aetiology for UTIs ([3]Kimando et al., 2010). There is a worldwide setback in management of many bacterial infectious diseases due to antibiotic resistance. It is estimated that globally 26 % of deaths are due to infectious diseases such as UTIs of which 98 % occur in low income countries. Kenya is among the low-income countries thus bears impact of urinary tract infections ([4]Wamalwa, 2013).
Microorganisms move from normal flora in the rectum, enter the urinary tract via the urethra into the bladder in healthy patients ([5]Kalantar et al., 2008). Uropathogens consequently colonize epithelium of the urethra in the ascending route. This route enhances acceleration of microorganisms in female patients who are soiling around the perineum, use urinary catheters and spermicidal agents. About half of the infections ascend into the upper urinary tracts in patient with cystitis and infections of pyelonephritis which are caused by ascension of the bacteria from the bladder through the ureters and into the renal pelvic region ([6]Patel et al., 2012). Pregnancy and urethral obstruction aid in attachment of uropathogens inhibiting urethral peristalsis. Microorganisms enter the renal parenchymal cells through the collecting ducts and reach the pelvic region resulting in inflammation of the urinary tract ([7]Manikandan et al., 2011)

2. MATERIAL & METHOD

The study targeted both male and female outpatients and inpatients presenting with symptoms and signs of UTI which include dysuria, polyuria, fever, nausea, and flank pain were sampled for this study. This study is done with an aim to study Antibiotic resistance among Uropathogenic Escherichia Coli. Baseline demographic data including age, sex, level of education and risk factors such as catheterization, history of UTI, also out and in patients were also collected. Samples were collected during the period between August 2018 to August 2021.

Inclusion Criteria
i) Adult patients and children who parents/guardians who consented.
 ii) Those patients presenting with clinical symptoms associated with UTI.
Exclusion Criteria
 i) Patients who or whose relatives declined to sign consent forms.
 ii) The patients who were on antibiotic therapy within one week were excluded.

Sample Collection and urinalysis

Sample Collection Urine samples were collected from 385 patients using midstream technique for adults and urine bags for infants. In women, samples were taken after vulva swabbing with clear water. All specimens were analyzed as soon as possible after collection to avoid deterioration of leucocytes.

3.7.2 Microscopy examination In the first step of microscopic evaluation of UTI, 10 ml of urine samples were centrifuged at 2000-3000 x g for 5-10 minutes. After centrifugation, supernatant was removed and one drop of deposit was placed onto the microscope slides, covered with cover slips and examined using light microscope under 10x and 40X objectives. Any bacteria (1 - 4) was defined as bacteriuria and leukocytes more than 5 in one high power field (hpf) was defined as pyuria (Oladeinde et al., 2011).

3. RESULTS

Table No. 01: Education

Education	N=385	Frequancy%	Positive	Negative	Chi-Square	P-Value
Illiterate	12	3.3	9	3	2.742	0.523
Primary	202	55.6	41	161		
Secondary	138	38.1	19	119		
Tertiary	11	3	2	9		

Table No. 02: Cathe-terisation

Cathe-terisation	N=385	Frequancy%	Positive	Negative	Chi-Square	P-Value
Yes	57	14.8	17	40	0.17	0.0504
No	328	85.2	95	233		

Female, 239 (62.1%) were the highest while male were 146 (37.9%). Among the patients in difference sex showed significance difference ($\chi2$ =0.116, P=0.0412). Patients who had history of UTI were 341 (88.6%) while those having no History of UTI were 42 (10.9%)

Table No. 03: Outpatient/ Inpatient

Outpatient/ Inpatient	N=385	Frequancy%	Positive	Negative
Outpatient	355	92.2	83	272
Inpatient	30	7.8	29	1

Out of total 385 patients, 355 (92.2%) are Outpatients and 30 (7.8%) are Inpatients

Table No. 04:

Bacterial Isolate	Total (%)	R0	R1	R(> 2)
Gram Negative	84 (70.0%)	5 (6%)	0 (0)	79 (94%)
E. coli	66 (80.5%)	1 (1.2%)	0 (0)	65 (98.5%)
Klebsiella pneumoniae.	12 (14.3%)	3 (3.5%)	0 (0)	8 (66.0%)
Proteusvulgaris	6 (5.9%)	1 (1.2%)	0 (0)	5 (83.3%)
Gram Positive	36 (30%)	7 (19%)	0 (0)	23 (63.8)
CNS	25 (69.4%)	4 (16%)	0 (0)	23 (92%)
S. aureus	11 (30.5%)	3 (27.3%)	0 (0)	8 (72.7%)
Total	**120 (100)**			

R0- No antibiotic resistance, **R1**- Resistance to one, **R2**-Resistance to more than two drugs.

Among the total 120 isolates, resistant to ≥2 drugs were recorded in 108 (90 %) of all uropathogens. Seventy seven (93.9 %) isolates of Gram-negative bacteria and 31(81.6 %) of Gram positive bacteria showed resistance to two or more drugs (Table 4). Resistance pattern of bacterial isolates to more than two antibiotics of patients (N = 120)

4. DISCUSSION

The prevalence of Gram-negative bacteria was 68.3 % (82) while Gram-positive isolates 31.7 % (38) which was similar to rates 75 % and 25 %, respectively of isolation of Gram-negative and Gram-positive bacteria reported in Kenyatta National Hospital, Kenya. The same rates of isolation of Gram-negative and Gram-positive bacteria of 60 % and 40 % were reported in Tirkur Anbessa Specialized Hospital Addis Abba, Ethiopia. Comparable rates of 61.9 % and 38.1 % reported in Tanzania (Sabrina et al., 2010)[8]. This could be associated with moisture and watery environment of the mucosal surface of the patients which helps in the invasion of bacteria to the uroepithelial cells. The initial attachments of microorganisms onto urinary tract tissues allow their replication and tissue invasion resulting into bladder infection and pyelonephritis in patients.

Among the isolates, E.coli was the most predominant organism in Index Hospital with total isolation prevalence of 55 %. These findings were more than those reported in other countries such as Yemen, 41.5 % Nigeria, 42.1 %, Khartoum North Hospital, and in Sudan, 42.4 %. These high rates were due to the presence of the normal flora in the rectal and vaginal area. Anatomical and functional changes of females make it difficult to maintain personal hygiene and as result increase the risk of acquiring UTI[9]. Grampositive cocci coagulase negative were the second dominant pathogens with total isolation prevalence of 20.8 %. These findings were lower than those reported from Tikur Anbessa Specialized Hospital Addis Ababa, Ethiopia 16 % and Tanzania 16.7 %. Gram-positive cocci coagulase negative were more common in urine samples among the sexually active young women (25-34 years). This is probably due to the fact that they are normal flora of both asymptomatic and patients thus take the advantage of the weak defence

mechanisms[10]. These organisms can be spread by hands or transmitted by animate or inanimate objects.

5. CONCLUSION

There is a need for continuous surveillance of antibiotic to the currently used antibiotics in management of urinary tract infections covering the entire Index Hospital . Index Hospital to enforce policies formulated by pharmacy and poison board to prevent misuse or underuse of antibiotics by giving prescription to only patients with results of culture and sensitivity and therefore treatment UTIs should be based on and sensitivity in order to limit multidrug resistance. Continuous follow up to provide an update of laboratory diagnosis of urinary tract infections in order to reduce multidrug resistance bacteria in UTI patients. Health care workers should enforce health education to patients in order to adhere to the treatment and thereby reducing drug resistance. v) Screening for resistance and identify modes of transmission.

Among the Gram-negative isolates, the predominant one was E.coli 66(81 %). Of the Gram-negatives, 55 % of all isolates demonstrated resistance to cotrimoxazole 41(61.7 %), followed by amoxicillin-clavulinic acid 32(48.8 %). E.coli isolates were sensitive to nitrofurantoin 66 (86.7 %), followed by cefotaxime 57(83.7 %), and gentamicin 54 (81.3 %)

6. REFERENCES

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