Available online on 15.05.2024 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Open Access Full Text Article

Research Article

Assessment of Urinary Tract Infections Among Female Patients Attending Ruhengeri Referral Hospital

Ishimwe Alain Prudence [1]*, Ntezirizaza Evariste[1,2], Yamukujije Clementine [1], Migabo Hiberte [1], Uwamahoro Consolée[1], Tuyishime Jean De Dieu[1]

[1:] *Ines-Ruhengeri, Faculty of Applied Fundamental Sciences, Department of Biomedical Laboratory Sciences, Rwanda*

[2:] *University Teaching Hospital of Kigali, Rwanda*

Article Info:

Article History:

Received 21 Sep 2023
Reviewed 18 March 2024
Accepted 19 April 2024
Published 15 May 2024

Cite this article as:

Alain Prudence I, Evariste N, Clementine Y, Hiberte M, Consolée U, Jean De Dieu T, Assessment of Urinary Tract Infections Among Female Patients Attending Ruhengeri Referral Hospital, Journal of Drug Delivery and Therapeutics. 2024; 14(5):19-22

DOI: http://dx.doi.org/10.22270/jddt.v14i5.6247

*Address for Correspondence:

ISHIMWE Alain Prudence, Ines-Ruhengeri, Faculty of Applied Fundamental Sciences, Department of Biomedical Laboratory Sciences, Rwanda.

Abstract

Background: Urinary tract infections (UTIs) are the inflammatory disorders of the urinary tract caused by the abnormal growth of pathogens. Urinary tract infection is known to cause short-term morbidity in terms of fever, dysuria, and lower abdominal pain (LAP) and may result in permanent scarring of the kidney. The presence of bacteria in the urine, known as bacteriuria, may be indicative of infection or colonization of the urinary tract, but it may also be due to bacterial contamination occurring during collection of a specimen.

Aim: The present study was done in order to identify the bacteria causing urinary tract infections from female patients attending Ruhengeri Referral Hospital.

Methodology: A cross sectional study was conducted on female patients who were attending Ruhengeri Referral Hospital in a period of two months from October to November 2021. Urine samples were collected from patients who were requested to urinary test with respect to standard procedures. Samples were processed and analyzed at INES-Ruhengeri microbiology laboratory where gram stain and culture as well as biochemical test were performed in order to make microbial identification. From the results patients who were found with UTI, their structured questionnaire was taken into consideration in order to determine the associated risk factors. The data on risk factors were collected using questionnaire that were designed in the preferred language. Data were collected and analysed using statistical package for social science, Microsoft excel, and the presentation of results was done using tables.

Results: The outcomes of the study indicated that *E.coli, K. pneumonia, P. aeruginosa, Enterobacter ssp* and *S. saprophyticus* were isolated from patients urine sample where *E. coli* is more present in patients sample where it has been found at 60%(18) samples. The least isolated bacteria in patient's samples are *Enterrobacter spp* and *S. saprophyticus* at frequency of 2(6.7) per each bacterium. The risk factor associated with urinary tract infection in female patients attended Ruhengeri referral hospital in a period of study, the results indicated that douching in secret parts twice a day is associated with urinary tract infection with P-value equivalent to 0.001.

Conclusion: This study was intended to assess the urinary tract infection among female patients attending Ruhengeri referral hospital. The study findings indicated that *E.coli, K. pneumonia, P. aeruginosa, Enterobacter ssp* and *S. saprophyticus* are more likely to be found in urinary tract of female patients. The study finding has indicated also that poor hygienic life style increases the risk of being infected by urinary tract infections.

Keywords: Urinary tract infections, Bacteria, Female patients.

INTRODUCTION

The urinary tract system consists of two kidneys, two ureters, a single urinary bladder, and a single urethra. Certain wastes, collectively called urine, are removed from the blood as it circulates through the kidneys. The urine passes through the ureters into the urinary bladder, where it is stored prior to elimination from the body through the urethra. In the female, the urethra conveys only urine to the exterior.[1] In male, the urethra is a common tube for both urine and seminal fluid. Where the ureters enter the urinary bladder, physiological valves prevent the backflow of urine to the kidneys. This mechanism helps shield the kidneys from lower urinary tract infections. In addition, the urea in urine has some antimicrobial properties. The flushing action of urine during urination also tends to remove potentially infectious microbes.[2]

Urinary tract infection (UTI) is among the common infections, nearly 10% of people experience it during their lifetime. UTI may be symptomatic or asymptomatic, community, or hospital acquired and can results in serious sequelae if left untreated. Although several different microorganisms can cause UTIs, bacteria are the major causative organisms and are responsible for more than 95% of UTI cases.[3]

Urinary system infections are most frequently initiated by an inflammation of the urethra, or urethritis. Infection of the

urinary bladder is called cystitis, and infection of the ureters is ureteritis. The most significant danger from lower urinary tract infections is that they may move up the ureters and affect the kidneys, causing pyelonephritis. Occasionally the kidneys are affected by systemic bacterial diseases, such as leptospirosis.[4]

The pathogens causing these diseases are found in excreted urine. Bacterial infections of the urinary system are usually caused by microbes that enter the system from external sources. In the United States, over 8 million urinary tract infections occur each year.[5] About 500,000 cases are healthcare-associated, and 75% of these are associated with urinary catheters. Because of the proximity of the anus to the urinary opening, intestinal bacteria predominate in urinary tract infections.

Millions of people worldwide are affected by urinary tract infections every year. There is a high increase in the prevalence of UTIs in Africa especially in sub-Saharan countries. In Rwanda, the previous study conducted in patients attending Butare University Teaching Hospital (BUTH) and Kigali University Teaching Hospital (KUTH) found that *E. coli* was the most common uropathogenic accounting 60.7% of UTI cases and frequently occurred in outpatients 70.6%.[6]

UTIs involve complex interaction between an organism, the environment and the potential host. The symptoms of a person with urinary tract infections depend on the age and the location. Chronic and acute infection of urinary tract leads to high blood pressure, kidney damage and results in death. Chronic manifestations of the UTIs are acute and chronic pyelonephritis (a disease process resulting from the effect of infection of parenchyma and pelvis of the kidney), cystitis, renal carbuncle, urethritis and prostatitis.[7]

The introduction of antibiotic therapy has played an important role in the management of UTIs. However, the major problem with current antimicrobial therapy is the rapid emergence of antibiotic resistance in both hospital and community acquired UTI cases.[8] Antimicrobial sensitivity testing (AST) was found to be a solution and reliable guidance to antimicrobial therapy. Unfortunately, the low-income countries do not have a well-equipped and functioning microbiology laboratory to perform AST.

In addition, turnaround time (TAT) of AST results is longer and cannot serve emergency cases. Thus, empirical treatment has become routine practice and the only solution especially in sub-Saharan countries. However, treatment failure associated to increased antimicrobial resistance is emerging.[9] The gold standard for the diagnosis of a urinary tract infection is the detection of the pathogen in the presence of clinical symptoms. The pathogen is detected and identified by urine culture (using midstream urine).[10] This also allows an estimate of the level of the bacteriuria. However, the minimum level of bacteriuria demonstrating an infection of the urinary tract has not been defined in scientific literature or standardized by microbiological laboratories. Hence, the main objective of this study is to investigate microorganisms that cause urinary tract infection and assess the risk factors associated with urinary tract infection among the female patients attending Ruhengeri referral Hospital.

METHODOLOGY

Study area

This study was carried out at Ruhengeri referral Hospital which is located in Muhoza sector, Musanze district, in the Northern Province of Rwanda.

Study design

A cross sectional study was carried out on isolation and identification of pathogenic microorganisms causing urinary tract infection in female patients attended Ruhengeri referral Hospital. The study was conducted in period of two months from October to November 2021. The 30 women patients suspected of having urinary tract infections were taken into consideration. Questionnaire was used to collect data of the risk factors associated with urinary tract infection in women patients who accepted to provide their contribution in this study. They were given questionnaire and urine sample were collected for each participant.

Study population

Target population was all women patients who were suspected for urinary tract infection during the period of the study.

Sample size

The sample size of 30 women patients was taken into consideration and this include all women suspected of urinary tract infection attended Ruhengeri Referral Hospital during period of the

Sample collection and processing

Appropriate personal protective equipment was worn. Urine samples were collected into labelled sterile bottles and closed tightly. Each sample was inoculated on prepared and labelled petri plates of MacConkey agar and Blood agar. Petri plates were incubated for 24-48 hours.

Isolation and identification of bacterial isolates

Samples for urine culture were tested within an hour of sampling. All samples were inoculated on blood agar as well as MacConkey agar and incubated at 37 ºC for 24 hours, and for 48 hours in negative cases. A specimen was considered positive for UTI if a single organism was cultured and observed and the presence of ≥5 leukocytes per high-power field were observed on microscopic examination of the urine. Bacterial identification was based on standard culture and biochemical characteristics of isolates to include: Lactose utilization Test, Triple Sugar Iron Test, Starch Hydrolysis Test, Oxidase Test, Catalase Test, Indole Production Test, Methyl Red, Voges Proskauer Test, Citrate Utilization Test, Urease Test. Gram staining was also performed for bacterial observation under microscope.

Statistical analysis

Data were checked for completeness, entered, and analysed by using Statistical package for social sciences (SPSS version 20). The results presentation was done by using tables.

RESULTS AND DISCUSSION

Socio-Demographic characteristics of the study population

In this study the socio- demographic characteristic of the population were established to characterize the population. The table below presents the summary of socio-demographic characteristics and the frequency.

The socio-demographic characteristics of the study population

The table above represents the outcomes about socio-demographic characteristics and frequencies of female patients suspected of having urinary tract infection based on age. In this table, higher number of patients was found in the range of 30-39 equivalents to 40% (12) while the small number of patients was found in patients ≤19 equivalent to 6.7% (2).

AGE	Frequency	Percentage%
≤19	2	6.7
20-29	10	33.3
30-39	12	40
40-49	6	20
TOTAL	30	100

Bacteria isolation by using Biochemical test

In this study the pathogenic bacteria of urinary tract among female patients were determined. Biochemical tests were performed in order to isolate bacteria that have been grown on different media. The results of isolated bacteria were displayed in the table.

Isolated bacteria of urinary tract

BIOCHEMICAL TESTS	*E.coli*	*K.pneumoniae*	*P. aeruginosa*	*Enterobacter spp*	*S.saprophyticus*
Simple staining	Rods	Rods	Rods	Rods	Coccus
Gram staining	_	_	_	_	+
Glucose	+	+	_	+	_
Lactose	+	+	_	+	_
Gas	+	+	+	+	_
H2S	-	-	_	_	_
Indole	+	+	_	_	_
Motility	+	_	+	+	_
Urea Broth	_	_	_	+	_
Coagulase	_	_	_	_	_
Catalase	_	_	_	_	+

The table above represents isolated bacteria from urine samples of patients suspected of having urinary tract infection. As indicated in this table, the bacteria isolated include: *E.coli, K. pneumonia, P. aeruginosa, Enterobacter ssp* and *S. saprophyticus.* As indicated in this table all bacteria isolated were gram negative bacteria and are rods shaped except *S. saprophyticus* which is gram positive and was coccus shaped.

Frequency and percentage of isolated bacteria

The study has identified the number of bacteria which have been isolated from the urine samples of patients. The table below indicates number of samples containing certain bacteria.

The frequency of isolated bacteria in patient's samples

The table above indicates the frequency of isolated bacteria in which *E. coli* is more present in patients' sample where it has been found at 60% (18) samples.

The least isolated bacteria in patient's samples are *Enterobacter spp* and *S. saprophyticus* at frequency of 2(6.7) per each bacterium.

Bacteria	Frequency	Percentage%
E. coli	18	60
K. pneumonia	3	10
P. aeriginosa	5	16.6
Enterobacter spp	2	6.7
S. saprophyticus	2	6.7
TOTAL	30	100

The risk factors associated with urinary tract infection among the female patients attending Ruhengeri Referral Hospital

The study has assessed the possible risk factors associated with urinary tract infection among female patients attending Ruhengeri referral hospital.

Risk factors associated with urinary tract infection

		Urinary tract infection			Test		
Risk factors		Frequency	Positive case	Prevalence	Df	$\chi 2$	P-value
Unprotected sex	YES	16	3	18.75	1	1.22	0.27
	NO	14	1	7.14			
Multiple sex partner	YES	8	2	25	1	0.17	0.68
	NO	22	3	13.64			
Latrine use	YES	13	4	30.77	1	0.29	0.59
	NO	17	2	11.76			
Douching in secret part	YES	2	0	0	1	10.83	0.001
twise a day	NO	28	23	82.14			

This represents the risk factors associated with urinary tract infection in female patients attended Ruhengeri referral hospital in a period of study. As shown in this table douching in secret parts twice a day is associated with urinary tract infection with P-value equivalent to 0.001.

DISCUSSION

This study examined urinary tract infection among female patients attending Ruhengeri referral hospital. In this study, the results show that women at age between 30-39 are more likely affected by urinary tract infection at a level of 40%(12), this is due to the fact that in this period most of these women are more concentrated on their children and do not care on themselves, this finding are similar to other finding found in different studies including study conducted in Nepal which have indicated that women at this age are more affected by urinary tract infection at 45%. [11]

The present study have isolated different kind of bacteria in urine sample including: *E.coli, K. pneumonia, P. aeruginosa, Enterobacter ssp* and *S. saprophyticus* in which *E.coli* was more prevalent at a degree of 60% of patients. These results are comparable to other studies that have been conducted in different countries for example the study which have taken place in Scandinavian which have indicated that the above bacteria are more likey to be found in urinary tract of infected women, this study have found also that *E.coli* is more prevelent.[12]

After examining the most bacteria infecting urinary system of female patients, the study has gone beyond to see the risk factors more associated with urinary tract infections. The study has found that no douching in secret part twice a day is more likely to result in urinary tract infection. This finding is in comparison to other findings which have been done in Columbia, the result of their findings indicated that lack of hygiene is more linked to urinary tract infection at a rate of 67%.[13]

CONCLUSION

This study was intended to assess the urinary tract infection among female patients attending Ruhengeri referral hospital. The study findings indicated that *E.coli, K. pneumonia, P. aeruginosa, Enterobacter ssp* and *S. saprophyticus* are more likely to be found in urinary tract of female patients. Further studies are needed in order to assess more microorganisms that can be found in UTI patients. The study finding has indicated also that poor hygienic life style increases the risk of being infected by urinary tract infections.

Acknowledgments

We extend our gratitude to Ruhengeri Referral Hospital administration for facilitating this study at their health facilities and Ines Ruhengeri to allow us to conduct this study in their Laboratory.

Author Contributions

ISHIMWE Alain Prudence Contributed in study design, methodology and experiment. Other authors contributed in manuscript writing and corrections.

Conflict of interest

Authors declare no conflict of interest

Fundings

N/A

Ethical consideration

Prior to this study, official approval to conduct this study was obtained from Ruhengeri Referral Hospital by the Director of the Hospital. The principle of confidentiality and respect of patient privacy are the rule as the research was carried out in health sector and the results were only used for academic purpose. Laboratory numbers was used as unique identifiers in order to maintain confidentiality which was corresponding to the visit numbers of the Hospital Information System (HIS).

References

1. Ganzeboom, K. M., Uijen, A. A., Teunissen, D. T., Assendelft, W. J., Peters, H. J., Hautvast, J. L., & Van Jaarsveld, C. H. Urine cultures and antibiotics for urinary tract infections in Dutch general practice. Primary health care research & deve, 2019; 7(10), 23-34. https://doi.org/10.1017/S146342361800066X PMid:30168406 PMCid:PMC6536752

2. Smelov, V., Naber, K., & Johansen, T. E. B. Improved classification of urinary tract infection: future considerations. European Urology Supplements,2016; 15(4), 71-80. https://doi.org/10.1016/j.eursup.2016.04.002

3. Togan, T., Azap, O. K., Durukan, E., & Arslan, H. The prevalence, etiologic agents and risk factors for urinary tract infection among spinal cord injury patients. Jundishapur Journal of Microbiology,2014; 7(1), 15-23. https://doi.org/10.5812/jjm.8905 PMid:25147663 PMCid:PMC4138667

4. Nowicki, B. Urinary tract infection in pregnant women: old dogmas and current concepts regarding pathogenesis. Current Infectious Disease Reports,2014; 4(6), 529-535. https://doi.org/10.1007/s11908-002-0041-z PMid:12433330

5. Hart, A., Pham, T., Nowicki, S., Whorton Jr, E. B., Martens, M. G., Anderson, G. D., & Nowicki, B. J. Gestational pyelonephritis-associated Escherichia coli isolates represent a nonrandom, closely related population. American Journal of Obstetrics,2005; 14(22), 34-46.

6. Ntirenganya, C., Manzi, O., Muvunyi, C. M., & Ogbuagu, O. High prevalence of antimicrobial resistance among common bacterial isolates in a tertiary healthcare facility in Rwanda. The American Journal of Tropical Medicine and Hygiene, 2015; 92(4), 865-872. https://doi.org/10.4269/ajtmh.14-0607 PMid:25646259 PMCid:PMC4385787

7. Bennet, C. J., Young, M. N., & Darrington, H. Differences in urinary tract infection in male and female spinal cord injury patients on intermittent catheterisation. Paraplegia Journal, 2010; 33(2), 69-72. https://doi.org/10.1038/sc.1995.17 PMid:7753570

8. Hillebrand, L., Harmanli, O. H., Whiteman, V., & Khandelwal, M. Urinary tract infections in pregnant women with bacterial vaginosis. American Journal of Obstetrics and Gynecology,2002; 186(5), 916-917. https://doi.org/10.1067/mob.2002.123987 PMid:12015512

9. Ramzan, M., Bakhsh, S., Salam, A., Khan, G. M., & Mustafa, GRisk factors in urinary tract infection. American Jouranal of Medicine,2004;4(7), 34-45.

10. Mansour, A., Mahdinezhad, M., & Pourdangchi, Z. Study of bacteria isolated from urinary tract infections and determination of their susceptibility to antibiotics. Health Sceiences, 2008; 5(8), 11-16.

11. Chhetri, P. K., Rai, S. K., Pathak, U. N., Thapa, J. B., Devkota, K. C., Shrestha, B. O., & Shrestha, R. R. Retrospective study on urinary tract infection at Nepal Medical College Teaching Hospital, Kathmandu. Nepal Medical College Journal,2011 3(7), 83-85.

12. Jellheden, B., Norrby, R. S., & Sandberg, T. Symptomatic urinary tract infection in women in primary health care: bacteriological, clinical and diagnostic aspects in relation to host response to infection. Scandinavian Journal of Primary Health care,2005; 79(45), 11-34.

13. Harrington, R. D., & Hooton, T. M. Urinary tract infection risk factors and gender. The journal of gender-specific medicine: JGSM: the official journal of the Partnership for Women's Health at Columbia. Medical Journal,2000; 3(8), 27-34.