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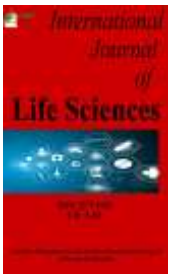

Full Length Research Paper

Detection And Prevalence of Urinary Tract Infection Causing Bacteria from Specimens in Tertiary Care Hospital, Dewas, Madhya Pradesh.

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ARTICLE DETAILS

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ABSTRACT

Urinary tract infections (UTI) remain a major medical problem occurring frequently and worldwide. UTI is defined as a disease caused by microbial invasion of the genitourinary tract that extends from the renal cortex of the kidney to the urethral meatus. The presence of detectable bacteria in the urine is named as bacteriuria .Our study aimed to detection and prevalence of urinary tract infection causing bacteria from specimens in tertiary care hospital. The present study was carried out in the Department of Microbiology, Amaltas Institute of Medical Science(AIMS),Dewas, Madhya Pradesh. A total of 1012 samples related to urinary tract infection(UTI) were received from different department in the microbiology laboratory. These include midstream urine samples, catheter samples and urine specimens from infants. Out of these total samples, microorganisms were isolated in only 739 samples. **:** A total of 1012 urine samples were collected among which 739 (73.02%) samples were tested positive for UTI in their analysis and prevalence was found higher in female patients (67.12%) as compare to male patients (32.88%). It is observed that, *E.coli* was isolated 54.94% of the total isolated microorganisms*, Klebsiella* spp. was isolated 26.66%, *Proteus* spp., especially *P.mirabilis* isolated 13.6*%, Pseudomonas aeruginosa* was isolated 2.84%. Apart from this, *Staphylococcus aureus* was isolated 1.76%, *Candida* spp. was isolated 0.27%,*Enterococcus faecalis* was also isolated 0.27%.The most effective antimicrobial agents in our study were Meropenem, Gentamicin, Nitrofurantoin and Cotrimoxazole whereas higher resistance was observed among Fluoroquinolones, Amoxicillin and third generation Cephalosporins, these are the drugs which are commonly given empirically for UTI. The purpose of the present study is to study the prevalence of urinary tract infection in the UTI suspected patient, the rate of *E.coli* is rising very quickly and becoming most important problem in the part of UTI. Hence, now it is very important to detection and prevalence of UTI causing bacteria and modifying the strategies of treatment.

1. Introduction:

Urinary tract infections (UTI) remain a major medical problem occurring frequently and worldwide. Urinary Tract Infections (UTIs) are the most common bacterial infections, accounting for 25% of all infections. UTIs occur in all populations and ages, however it is common in women. It also contributed as the most common nosocomial infection in many hospitals and accounts for approximately 35% of all hospital acquired infections. In addition, the financial impact is enormous with costs exceeding $ 1.6 billion for community acquired UTI [1]. UTI is one of the most important reasons for increased morbidity and healthcare expenditure [1]. In community, women are more prone to develop UTI. About 40-50% of women have a history of at least one episode of UTI. This may be either due to anatomical predisposition of uroepithelium mucosa adherence to the mucopolysachharide lining or the host factors [2]. UTI is defined as the presence of microbial pathogens within the urinary tract. Bacterial contamination of normally sterile urine occurs by the retrograde

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movement of microorganisms, from the perineum through the urethra. Generally, urinary tract is protected from infection by number of mechanisms. For example, anatomical defense mechanism involves special group of muscles near the urethra which keep the system closed most of the time preventing entrance of commensal bacteria of urethra to bladder. The composition of urine (Low pH high urea concentration, high osmalarity), the mucosal defenses like secreted proteins which prevent bacterial adhesion and mechanical factors such as downwards flow of urine flushing out the microorganisms by regular complete removal of urine from the bladder also help in prevention of UTI [3,4].

The normal urine contains antimicrobial substances such as small quantities of antibodies and organic acids. larger quantities of specific antibodies can be found in urine during UTIs. Antibody –forming lymphoid cells in the infected bladder or kidneys form protective antibodies locally at the site where these are needed [4].

UTI can be classified on the basis of anatomic site of involvement, complication of UTI, environment and presence or absence of specific symptoms of UTI. On the basis of anatomic site of infection, it is divided into two broad categories, lower UTI and upper UTI . Infections of lower urinary tract include urethritis, cystitis and prostatistis. Lower UTI is due to ascending infection caused by faecal colioform.The upper urinary tract infection includes acute pyelitis (infection of pelvis of kidney, acute pyelonephritis (infection of parenchyma of kidney) pyelonephritis is probably due to haematogenous infection [5].

The main symptoms of the lower UTI include urgency, increased frequency, dysuria (pain on urination), bladder pressure and a foul odor of urine. The urine may be bloody and cloudy [3]. There may also be a feeling of fullness in the lower abdomen or pain above the pubic symphysis [7]. Upper UTI is characterized by flank pain or tenderness just below ribs, fever and chills. In young children fever, abdominal pain vomiting and poor feeding occurs [3,6].

On the basis of symptoms there are two clinical features of UTI, symptomatic and asymptotic infection. Symptomatic infection is associated with significant bacteriuria (>10^5 CFU/ ml of urine) with symptoms of UTI. Asymptomatic infection (silent infection or covert bacteriuria) is defined as the presence of significant bacteriuria with no symptoms of UTI.UTI may be caused by bacteria, fungi, viruses and protozoa. Infection may be ascending type or descending type. Bacterial UTI are usually acquired by ascending route from the urethra to the bladder and may be extend to kidney [8]. UTI may also be acquired by descending route e.g. from kidney infections which results from bacteremia [9]. In few cases, the kidney can become infected with haematogenous route particularly after S. aureus bacteremia. The perinephric tissues can also become infected by this route and perinephric abscess may develop UTI [18].

The increasing antimicrobial resistance (AMR) among Gram-negative organism including *E.coli* is a growing public health concern in our country. This indicates the need for continuous monitoring of AMR to document any changing trends in our geographical region. As drug resistance among bacterial pathogens is vary with time to time regular surveillance and monitoring is necessary for giving updated information to physician for most effective empirical treatment of UTIs.

2. **Material and Method**:

Study was carried out for the detection and prevalence of urinary tract infection causing bacteria from specimens in the microbiology Department of Amaltas Institute of Medical Science(AIMS), Dewas, (M.P.) from December2019 to December 2021. Total 739 microorganisms were isolated for detection and prevalence of UTI in different types of specimens such as midstream urine samples, catheter samples and urine specimens from infants etc. The study design was approved by ethical committee and the protocol of study was reviewed and approved by the research cell of Amaltas Institute of Medical Science (AIMS),Dewas, (M.P.). Ethical committee also acquired the ethical approval.

2.1 Laboratory Diagnosis:

Culture of the urine is necessary for the identification of the organism and its antimicrobial susceptibility test.

2.2 Specimen Collection:

2.2.1 Midstream Urine Specimen (MUS)

It is collected preferably prior to administering antibiotics. Specimen is collected in a sterile container. Before collecting a sample, genitalia should be cleaned with soap and water and men are instructed to retract the foreskin of glans penis whereas women should keep the labia apart. The first portion of urine allowed to pass then without interrupting the urine flow, mid-portion of the stream is collected. The first portion of urine adequately flushes out the normal urethral flora.

2.2.2 Catheter specimen:

Urine should be collected directly from catheter and not from the collection bag. The catheter should not touch the container. Although a catheter specimen yields excellent results but catheterization to obtain urine is not justified because of risk of introducing infection.

2.2.3 Urine Specimens from Infants:
A clean catch specimen after cleansing of genitalia is preferred. Another procedure of collecting specimen in infants is suprapubic aspiration. This procedure may also be used in adult women when uncontaminated specimen cannot be obtained by other methods.

2.2.4 Transport:
As urine is a good culture medium, specimens after collection should reach the laboratory with minimum delay, if this is not possible, the specimen is to be refrigerated at 4°C.

2.2.5 Laboratory Methods:
Part of the specimen is used for bacteriological culture and the rest is examined immediately under the microscope.

2.2.6 Microscopy:
Urine is centrifuged and deposit is examined under microscope for detecting pus cells, epithelial cells, erythrocytes and bacteria. *Pyuria* is associated with most clinical infections but may be absent in symptomless bacteriuria. *Pyuria* without bacteriuria may be an indicator of renal tuberculosis. Presence of urinary casts, red cells, tubular epithelial cells or atypical cells will indicate non-infective lesions such as glomerulonephritis or tumor.

2.2.7 Culture:
Uncentrifuged urine is inoculated on blood agar and MacConkey's agar. Culture plates are incubated at 37°C for 24 hours. Bacteria isolated on culture are identified. Most laboratories use a semi quantitative method (standard loop technique) for culture of urine specimens.

2.2.8 Standard Loop Technique:
A standard calibrated loop is used to culture a fixed volume of uncentrifuged urine. Blood agar and MacConkey's agar are used and incubated at 37°C for 24 hours. Next day, the number of colonies obtained is counted and the total count per ml is calculated.

The fixed volume loop is 4mm in diameter and can hold 0.005 ml urine(i.e.200loopfuls make one ml), the total bacterial count per ml will be number of colonies multiplied by 200. Single bacterium would form a single colony; therefore, the number of colonies shall be equal to number of bacteria present.

Kass(1996) gave a criterion of active bacterial infection of urinary tract as follows:

- Count more than 10^5 bacteria of single species per ml: *significant bacteriuria* which indicates active UTI.
- Between 10^4 to 10^5 bacteria per ml is of *doubtful significance*, specimen should be repeated for culture.
- Less than 10^4 bacteria per ml: no *significant growth* but regarded as contaminant. Contamination is also considered when three or more bacteria are isolated.

2.2.9 Identification of the Organisms:
The organisms are identified by colony characteristics, Gram staining, motility, biochemical reaction and serological tests.

3. Results:

Mostly of the 739 samples, 54.94% showed the growth of *E.coli.* Apart from this, growth of other microorganisms was seen in remaining 45.06%, like the growth of *Klebsiella* spp. 26.66%, growth of *Proteus* spp. 13.26%, growth of *Pseudomonas aeruginosa* 2.84%, growth of *Staphylococcus aureus* is 1.76%, while the growth of *Candida* spp. 0.27% and *Enterococcus faecalis* growth 0.27% were also observed.

Table 1 : Distribution of Micro-organisms isolates from various clinical samples-midstream urine specimen, catheter specimen, urine specimens from infants,(n=739)

Name of Isolated Microorganisms	Number of Isolates	Percentage (%)
E.coli	406	54.94
Klebsiella spp.	197	26.66
Proteus spp. (*P.mirabilis)*	98	13.26
Pseudomonas aeruginosa	21	2.84
Staphylococcus aureus	13	1.76
Candida spp.	02	0.27
Enterococcus faecalis	02	0.27
Total	**739**	**100%**

Table 2 : Departments wise distribution of microbial growth. (n=739)

Departments	Total No. of Samples Received	No. of Specimen with Growth of Microorganisms
Obstetrics & Gynecology	623	467
Surgery	285	217
I.C.U.	61	32
Casualty	35	20
N.I.C.U.	05	02
Orthopedics	03	01
Total	**1012**	**739**

Table 3 : Gender wise distribution of microorganisms isolates. (n=739)

Gender	Total No. of Cases	Percentage (%)
Female	496	67.12
Male	243	32.88
Total	**739**	**100**

4. Discussion:

This study determined the detection and prevalence of urinary tract infection causing bacteria from specimens in tertiary care hospital. Our analysis demonstrated that the prevalence of bacterial UTI in patients attending Amaltas hospitals was 739/1012 (73.02%). Out of this bacterial UTI prevalence, symptomatic and asymptomatic patients contributed to 396/739 (53.5%) and 343/739 (46.4%), respectively. Almost half of the patients having significant bacteriuria were asymptomatic, and this situation is of utmost concern since asymptomatic bacteriuria is a strong predictor of ensuing symptomatic UTIs [22]. Previous study in Mulago by Mwaka et al. [23] found a much higher prevalence of significant bacteriuria of 29/40 (72.5%) in asymptomatic patients. The higher proportion in the study carried out at Mulago is not surprising, since the study included only adult females who are always at high risk of developing asymptomatic bacteriuria [20]. The higher prevalence of UTIs in our study could have been probably due to the inclusion of a number of risk groups like diabetes,[13,14] elderly, pregnant women, HIV,[10-12] infants[15,16], and a high number of inpatients who are usually prone to UTIs.

Our study demonstrated *E. coli* as the most prevalent bacterial uropathogen with 406/739(54.94%). This finding is comparable with other studies elsewhere in Africa indicating 40–46% of isolation of *E. coli* [24–27]. The high prevalence of *E. coli* in the female gender could be due to the close proximity of the anus to the vagina. This high possibility of UTIs in females is due to the inherent virulence of *E. coli* for urinary tract colonization such as its abilities to adhere to the urinary tract and also association with other microorganisms moving from the perineum areas contaminated with fecal microbes to the moist warmth environment of the female genitalia [19, 28].

This study demonstrated that age ≤19 years, female gender, married individuals, diabetes, genitourinary tract abnormalities, hospitalization, catheter, and increase in duration of catheter were found to bear statistically significant relationship with UTIs. Age and female gender were found to have statistically significant relationship with UTIs in similar study carried out by Kabugo et al. in 2016 [20]. The statistically significant association between UTIs and diabetes could be due to altered immunity in diabetic patients which includes depressed polymorphonuclear leukocyte functions, altered leukocyte adherence, chemotaxsis, phagocytosis, impaired bactericidal activity of the antioxidant system [29, 30], and neuropathic complications, such as impaired bladder emptying. In addition, a higher glucose concentration in the urine may create a culture medium for pathogenic microorganisms in diabetic patients that may result into UTIs. Generally, similar reports from elsewhere also indicated that age, female gender [20, 31], genitourinary tract abnormalities [13, 14], diabetes [21, 31, 32], married individuals [33], hospitalization [17], catheter, and duration of catheter [31] bear statistically significant relationship with UTIs.

5. Conclusion:

Urinary Tract Infection is the most prevalent microbial infection among all age groups can be prevented by following a hygienic lifestyle that includes avoiding unsafe sexual intercourse with multiple partners and also drinking enough amount of water. As the pathogens are multi-drug resistant there are more cases of recurrent UTI. It can be chronic, if the infection is not handled properly. Various antibiotics are being used against pathogens for ages. But the major drawback of using antibiotics is that the pathogens can become resistant and overcome the activity of the antibiotics. Various vaccines are turning out to be good candidates to treat Urinary Tract Infection. Hence many studies concentrate on finding herbal drugs for treating the infection. Various herbal formulations are becoming promising candidates against uropathogens by showing, anti-biofilm,anti-bacterial and anti-adhesive activity. Along with herbal

medicines the homeopathic and Unani formulations are acting as immune boosters by enhancing innate immunity. Ayurveda can also be considered as one of the modes of treatment that also has a similar mode of action as herbaldrugs.

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