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A review on the prevalence and predisposing factors responsible for urinary tract infection among adults

[1]Anuli S. John, [2]Clement I. Mboto and *[2]Basseye Agbo

[1]Department of General Studies, College of Health Technology, Calabar, Nigeria
[2]Department of Microbiology, Faculty of Biological Sciences, University of Calabar, P.M.B. 1115, Calabar, Nigeria

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ABSTRACT

UTI is a common bacterial infection that affects components of the urinary system. This infection affects all ages and both sexes. Despite these, women are usually more susceptible to this infection and has a higher prevalence compared to the men. Some of the risk factors responsible for this high prevalence is due to menopause, poor personal hygiene, pregnancy and the close anatomical relationship of the female urethra and the anus. Among the uropathogens involved in this infection, entrobacteriaceae especially the E.coli is usually the most prevalent and accounts for 80-85% of the total isolate. Most often this infection is usually neglected but it is capable of claiming life under severe circumstances. This article therefore reviews the prevalence and predisposing factors responsible for urinary tract infection in adults. UTI being a major problem faced by the populace and the cause of most health care expenditure, it is therefore important to know the predisposing factors responsible for this infection as this will serve as a guide to individuals, care givers and health planners to guide and managed the expected interventions as the management involves drug therapy and patients education.

Keywords: Urinary tract infection (UTI), uropathogens, bacterial infection, urethra, predisposing factor

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INTRODUCTION

Urinary tract infections (UTIs) are the most common bacterial infections affecting the populace both young and old. This infection usually affect one or more components of the urinary system and is particularly common among the female population with an incidence of about one percent of school aged girls and four percent of women through child bearing age [21].Reports from other studies reveals that most uropathogen causing UTIs colonize the colon, the perianal region, and in females the periurethral region forming a biofilm that usually resists the body's immune response. UTIs can also result from fecal pathogens that ascend the opening of the urethra, stick to the walls of the urethra, multiplying and then move up the urethra to the bladder where they cause annoying symptoms during urination [25]. Although, most UTIs are self-limiting, improving without treatment even when culture is positive, other poses dangerous health risk which if left untreated may tend to spread up through the ureters, into the kidneys resulting in pyelonephritis [10].It has been estimated globally that UTIs result in as many as 8.3 million visits to outpatient clinics, 1 million visits to emergency departments, and 100,000 hospitalizations annually [13]. Although this infection affects both genders, women are the most vulnerable may be due to their anatomy and reproductive physiology. The prevalence also increases with advancing age, catheterization, sexual activity, menopause and prostate problems [7]. The predominant organisms responsible for UTI are mostly the Enterobacteriaceae especially

E. coli which are the cause of 80–85% of urinary tract infections. Laboratory investigations are required for the diagnosis and confirmation of UTI while treatment is based on information obtained from the antimicrobial susceptibility testing [1].This review therefore outlines the prevalence and predisposing factors responsible for urinary tract infections in adults.

2 THE URINARY SYSTEM

2.1 Anatomy of the Urinary System

The urinary system consists of the kidneys, ureters, urinary bladder, and urethra. Often, urinary tract infections (UTIs) are characterized as being either upper or lower based primarily on the anatomical location of the infection. The lower urinary tract encompasses the bladder and urethra, while the upper urinary tract encompasses the kidneys and the ureters. The kidneys filter the blood to remove wastes and produce urine. The ureters, urinary bladder, and urethra together form the urinary tract, which acts as a plumbing system to drain urine from the kidneys, store it, and then release it during micturition. Besides filtering and eliminating wastes from the body, the urinary system also maintains the homeostasis of water, ions, pH, blood pressure and calcium [23].

2.2 Etiology of infection

Many different microorganisms can infect the urinary tract and cause infection, but the most common agents are the Enterobacteriaceae. *E. coli* is usually the most prevalent organism responsible for UTI and accounts for 80–85% of the total isolates, with *Staphylococcus saprophyticus* being the cause in 5–10% [19]. Other bacterial causing UTIs include *Klebsiella*, *Proteus*, *Pseudomonas*, *Enterococcus*, *Enterobacterspp. etc*. Organisms such as *Serratia* and *Pseudomonas* assume increasing importance in recurrent infections and infections associated with urologic obstructions. They also play major role in nosocomial and catheter associated infections. *Proteus specie* by virtue of urease production and *Klebsiella spp* through the production of extracellular slimy polysaccharides are predispose to stone formation in the kidneys and are isolated more frequently from patient with calculi [14].Gram positive cocci play a lesser role in urinary tract infections. However, *Staphylococcuss aprophyticus* novobiocin resistant, coagulase-negative specie accounts for 10 to 15% of acute symptomatic urinary tract infections in young females while Enterococci occasionally cause acute uncomplicated cystitis in women [15].

Other cause of urinary tract infections includes sex, urinary catheters, diabetes, and lack of circumcision and prostate problems [20]. Complicating factors include predisposing anatomic, functional, or metabolic abnormalities. Persons with spinal cord injury are at increased risk for urinary tract infection because of chronic use of catheter, and voiding dysfunction.

Virus and parasite are not usually considered as urinary pathogens but however, Virus plays a major role in the pathogenesis of hemorrhagic cystitis [3].

2.3 Epidemiology of Urinary tract infection

All individuals are susceptible to UTIs; however the prevalence of infection differs with age, sex and certain predisposing factors. Urinary tract infections are the most frequent bacterial infection in women [5].They occur most frequently between the ages of 16 and 35 years, with 10% of women getting an infection yearly and 60% having an infection at some point in their lives. Recurrences are common, with nearly half of people getting a second infection within a year [22].Rates of bacteriuria increases with age from two to seven percent in women of child bearing age to as high as 50% in elderly women [5].

Among the most common infectious diseases, urinary tract infections (UTIs) are commonly encountered diseases by clinicians in developing countries with an estimated annual global incidence of at least 8.3 million doctor visit yearly [13].They are important complications of diabetes, renal disease, renal transplantation and structural and neurologic abnormalities that interfere with urine flow and a source of bacteremia in these patients.

2.4 Prevalence of Urinary tract infection

The prevalence of urinary tract infection is high in females compared to the males. Estimate shows that one third of adult women are diagnosed with UTI before 24 years [6]. Women are especially more prone to developing UTI due to anatomical factors that allows bacterial quick access to the bladder, poor hygiene; sexual intercourse and use of contraceptive are also contributory factors. Also hormonal changes such as menopause and estrogen loss are responsible for the high prevalence of UTI in older women. With estrogen loss, the system ability to resist bacterial colonization is reduced making it liable to infection [17]. UTI in men are rare but when they occur it usually comes

with severity and are most times refers to as complicated. Men who are not circumcised tend to be more prone to UTI because the bacterial build at the extra fold of their skin thus making them vulnerable [20].Also elderly men are at increased risk of developing UTI due to factors such as kidney stones or prostate problems. Any abnormality of the urinary tract that interferes with the flow of urine set the stage for increased risk of complicated UTI.

2.5 Types of urinary tract infections

Urinary tract infection usually develops in the lower urinary tract (urethra and bladder) and if not properly treated they ascend to the upper urinary tract (ureters and kidneys) and cause severe damaged to the kidneys. Other complications caused by UTIs are bladder infection (cystitis), urethra infection(urethritis), kidney infection (pyelonephritis) and ureter (ureteritis).

Urethritis is simply an inflammation of the urethra, which is a tube that carries urine out of the body. It is often caused by sexually transmitted infection or due to an injury from an instrument such as urinary catheter or even exposure to an irritating chemical such as antiseptic or spermicide. Urethritis can either be gonococcal urethritis caused by *gonorrhea* bacteria or non-gonococcal urethritis caused by bacteria other than *gonorrhea* such as *Chlamydia trachomatis, Ureaplasma urealyticum, Mycoplasma genitalium* and *Trachomonas vaginalis*. Cystitis is a bladder infection caused by abnormal growth of bacteria inside the bladder and the most common bacterial infections[3].Cystitis can betraumatic, interstitial, eosinophilic, hemorrhagic, and cystitis cystic [18]. Ureteritisis infection of the ureters which are tubes connecting the kidneys and the bladder. Infection occurs when the ureter to bladder valves don't work properly and allow urine to "reflux" from the bladder into the ureters. Pyelonephritis is an infection that affects one or both kidneys. It can happen with infection from above, or if urine refluxes back to the kidney. Kidney infections can cause kidney damage or even failure if left untreated for an extended period of time [10].

2.6 Pathogenesis of Urinary Tract Infections

Bacteria that cause urinary tract infections usually enter the bladder through the urethra. However, infection may also occur via the blood or lymph. It is believed that the bacteria are usually transmitted to the urethra after a bowel movement. After gaining entrance, organism such as *E. coli* attaches to the bladder wall and form a biofilm that resists the body's immune response [21].Other bacterial characteristics such as motility are also important in the organism pathogenesis of UTIs because it enable the organism to ascend to the upper urinary tract and obstruct urine flow which might result in pyelonephritis [15].Virulence factors of bacteria play an important role in urinary tract infections. Some organism particularly uropathogenic *E. coli* (UPEC) which is present within bowel flora can infect the urinary tract by expressing some specific virulence factors that permit adherence and colonization of the lower urinary tract causing urinary tract infections [12]. Adherence of this microorganism depends on three major features; bacteria's own adhesive mechanism, the receptive features of the urothelium organism and finally the fluid that is present between both surfaces. Adhesins found on the surface of the bacterial membrane are responsible for initial attachment onto urinary tract tissues forming a biofilm. With biofilm formation, bacterial cooperate with one another to remain viable [15].This biofilm form an irreversible association with the host cell and prevent the host's neutrophils from penetrating its surface [21].Bacteria that have irreversibly attached to a surface usually serve as a means for continued replication and recruitment of other bacteria.

Pathogenesis can also be through ascending or hematogenous route. Ascending route is the most common route of infection in females and is aided by conditions such as pregnancy, urethra obstruction and instrumentation. Blood borne route (hematogenous route) occurs as a result of bacteremia although it is mostly not common.

3.PREDISPOSING FACTORS OF URINARY TRACT INFECTIONS

The urinary system is biologically structured to help ward off infections. The ureters and bladder are supposed to prevent urine from backing up towards the kidneys. The flow of urine from the bladder is designed to wash bacterial out of the body. Despite all these, infections still occurs due to some predisposing factors such as alterations to the host's natural defense mechanisms, anatomical and physiological factors, premenopausal / menopausal factors, age and sex, obstruction, instrumentation *etc*.[13][18]

3.1 Alterations to the Host's Natural Defense Mechanisms

The host natural flora is usually altered due to actions such as extreme use of antimicrobial agent, use of contraceptive like spermicide, obstruction and stasis of urine flow can significantly alter the host's defense

mechanisms and predispose to complicated UTIs. Also illness such as diabetes mellitus, sickle cell disease, gout and analgesics can also altered the host's natural defense mechanisms [7].

3.2 Anatomical and Physiological Factors

A number of factors contribute to a greater prevalence of UTIs in females compared to males. In particular, female pelvic anatomy plays an important predisposing role for recurrent UTIs in female patients. A study carried by Hooton *et al.*, (2010) investigated differences in perineal anatomical measurements and voiding characteristics in 100 females with a history of recurrent UTIs and in 113 females with no prior history of UTIs. Analysis of the results demonstrated that the urethra and anus were significantly closer together in cases of UTI (4.8 ± 0.6cm) compared to controls (5.0 ± 0.7cm). Other important physiological and anatomical factors that predispose to bacterial adherence in females (compared to males) include a drier urethral meatus, a shorter urethra and the absence of antibacterial properties provided by prostatic fluid.

3.3 Premenopausal / Menopausal Female

In premenopausal women, 90% of the vaginal flora is *Lactobacilli*, which protect the system against colonization with uropathogens such as *E. coli*, with estrogen loss at menopause, it results in the thinning of the vaginal epithelium and decreased amount of glycogen. The resulting environment is usually hostile to *Lactobacilli* thereby decreasing their numbers. Biological changes due to menopause put these women at particular risk of contracting both primary and recurring UTIs because with estrogen loss, the walls of the urinary tract becomes weak and as such it reduces its ability to resist bacteria colonization [17].

3.4 Age and Sex

The incidence of urinary tract infection increases with age. During the first few months of life, the incidence of urinary tract infections in male exceeds that of females. From the first year onwards, both first time and recurrent urinary tract infection is much more common in females. The female urethra appears to be particularly prone to colonization because of its proximity to the anus [15].Men's risk for UTI increases with age, men become more susceptible to UTIs after 50 years of age, when they are more likely to develop prostate problems due to loss of prostate fluid. Enlarged prostate gland can also impede and slow the flow of urine, thus raising the risk of infection. Nicolle, (2008) observed that men who are not circumcised tend to also be more prone to developing UTIs because these bacterial build up much more easily in the folds of the extra skin on the penis thereby making them more susceptible to developing UTIs.

3.5 Obstruction

Obstruction to the flow of urine from the kidney through the pelvis, ureter, bladder, and urethra, is a common disorder. It causes stasis and a rise in pressure within urinary tract, which predispose to urinary tract infection. Obstruction may occur at any level but is most often found at the pelvis ureteric junction. Obstruction to the easy flow of urine may be the result of some gross anatomical abnormalities such as congenital or acquired pathological conditions in the urinary tract. Obstruction can also lead to reflux of infected urine in the urethra back into the ureter and kidney with consequent pyelonephritis[18].

3.6 Instrumentation

Bacteria develop in at least 10-15 percent of hospitalized patients with indwelling urethral catheters [7]. Factors associated with an increased risk of catheter associated urinary tract infection include, prolonged catheterization, severe underlying illness, disconnection of the catheter and drainage tube and lack of systemic antimicrobial therapy. Bacteria usually enter the catheter system at the catheter collecting tube junction or at the drainage bag portal. The organisms then ascend into the bladder within 25 to 72 hours causing annoying symptoms [16].

3.7 Management of Urinary Tract Infections

Management of urinary tract infections typically involves drug therapy and patients' education [1]. The ideal treatment of urinary tract infection is an antibacterial agent that effectively eradicates bacteria from the urinary tract with minimal effects on fecal and vaginal flora, thereby minimizing the incidence of vaginal yeast infections. The antibacterial agent used for the management of uropathogen should be affordable, produce few side effects and of low resistance. Various treatments regimen have been used successfully to treat uncomplicated lower urinary tract infections in women [11].Early recognition of urinary tract infection and prompt treatment are essential to prevent recurrent infection and complications such as renal failure and sepsis [22]. The role of treatment is to prevent infection from progressing and causing permanent renal damage and failure. For management to be effective,

patients must be taught how to recognize early signs and symptoms and to initiate treatment as prescribed [24]. Also antimicrobial therapy should be initiated promptly after a proper urine culture is obtained.

4. LABORATORY DIAGNOSIS OF URINARY TRACT INFECTIONS

Diagnosis of urinary tract infection is based on the presence of bacteria in urine at a significant level [15].The diagnosis of the infection involves the collection of midstream urine specimens, urinalysis, microscopic examination, urine culture and microscopy as described by cheesebrough, 2006.

CONCLUSION

With the rapidly growing economy, urinary tract infections has become a major problem in the world at large and Nigeria in particular causing serious health issues and health care expenditure. Despite being an infection that affects all ages and both genders, women are usually more susceptible. This high prevalence in women is due to factors such as poor personal hygiene, use of contraceptives, menopause and the close proximity of the female urethra to the anus. Elderly men are also at risk due to the fact that most men tend to develop prostate problems due to loss of prostate fluid. This condition usually impedes the flow of urine thus making them liable to infection. Therefore investigating it predisposing factors is fundamental for individuals, care givers and health planners to guide and managed the expected interventions.

REFERENCES

[1] Amdekar, S., Singh, V. and Singh, D. D. *Current Microbiology*,**2011**,*63(5), 484–490*.
[2]Chessbrough, M.*Medical Laboratory Manual for tropical countriesELBS Edition*. Tropical health technology publications,UK,**2006**,Pp. 22-392
[3] Chung, A., Arianayagam, M. andRashid, P. *Australian Family Physician*,**2010**, *39(5),295-298.*
[4] Colgan, R. and Williams, M. *American Family Physician*, **2011**,*84(7), 771–776.*
[5] Dielubanza, E. J. and Schaeffer, A. J. *The Medical Clinics of North America*, **2011**, *9(1), 27–41.*
[6] Foster, R. T. S. *Obstetrics & Gynecology Clinicians North American*, **2008**, *35,235–48.*
[7] Gould, C. V., Umscheid, C. A., Agarwal, R. K., Kuntz, G. and Pegues, D. A. *Infectious Control Hospital Epidemiology*,**2010**,*31(4), 319–326.*
[8] Griebling, T. L. Urinary tract infection in women. In: Litwin M.S., Saigal, C.S., Eds. *Urologic Diseases in America.* Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. Washington, D.C.: **2007**,GPO. NIH publication.
[9] Hooton,T. M., Bradley,S. F. andCardenas,D. D. *Clinical infectious disease*, **2010**, *50,625- 663*
[10] Lane, D. R. and Takhar, S. S. *Emergency medicine clinics of North America*, **2011**,*29(3), 539–552.*
[11]Little, P., Moore, M. V. and Turner, S. *Biochemical Medical Journal*, **2010**,*5, 340-349*
[12] Litza, J. A. andBrill, J. R. *Prime Care*, **2010**,*37(3), 491- 507.*
[13] Naber, K. G., Schito, G., Botto, H., Palou, J. andMazzei, T. *European Urology*,**2008**,*54(5),1164-1175.*
[14] Nicolle,L. E., Bradley, S. and Colgan, R. *Clinic of Infectious Disease*, **2005**,*40,643.*
[15] Nicolle, L. E. *Urology Clinics North America*,**2008**,*35(1), 1–12.*
[16] Pallett, A. and Hand, K. *Journal of Antimicrobial Chemotherapy*, **2010**,*65(3),* 25–33.
[17] Perrotta, C., Aznar, M., Mejia, R., Albert, X. andNg, C. W. *Cochrane database of systematic reviews (Online)* **2008**, *(2), 5131.*
[18] Popescu, O. E., Landas, S. K. and Haas, G. P. *Archives of Pathology & Laboratory Medicine*,**2009**,*133(2),* 289–294.
[19] Pushpalatha, K. S. *Journal Nighting Nursing Times*, **2008**,*4(5), 28-32.*
[20] Raynor, M. C. andCarson, C. C. *The Medical Clinics of North America*, **2011**,*95(1),* 43–54.
[21] Salvatore, S., Cattoni, E., Siesto, G., Serati, M., Sorice, P. andTorella, M. *European Journal of Obstetrics, Gynecology, and Reproductive Biology*, **2011**,*156(2), 131–136*
[22] Stapleton, A. E., Dziura, J. and Hooton, T. M. *A randomized controlled trial. Mayo Clinical Process*, **2012**,*87(2), 143-156*
[23] Tim Taylor, M. *Inner Body Journal*, **2014**,*52, 16-18*
[24] Wang, C. H., Fang, C. C., Chen, N. C., Liu, S. S., Yu, P. H., Wu, T. Y., Chen, W. T. Lee, C. C. and Chen, SC. *Archives of Internal Medicine*,**2012**,*172(13),988–996.*
[25] Willey, J. M., Sherwood, L. M. and Woolverton, C. J. *The host microbe interaction in: Presscott's Microbiology, 8th Edition, McGraw Hill Publisher, Glasgow*, **2011**,*pp 731-736.*