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# Urinary Tract Infection and its Risk Factors in Women: An Appraisal

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**A urinary tract infection (UTIs) is the one of the most common bacterial infection in women than in men, at a ratio of 8:1 and a major cause of morbidity. Approximately 50–60% of women report at least one UTI in their lifetime. UTI is caused by pathogenic invasion of the urinary tract which leads to an inflammatory response of the urothelium. The clinical manifestation of UTI depend upon the portion of the urinary tract involved, the etiologic organism, the severity of the infection and patients ability to mount an immune responds to it. Signs and symptoms include fever, dysuria, and urinary urgency, cloudy or malodorous urine. UTI is higher in women due to several clinical factors including anatomic differences, hormonal effects and behavioral pattern. Malnutrition, poor hygiene, low socioeconomic status is associated with UTI and these factors are rife in rural settings. UTI is mostly caused by gram negative aerobic bacilli found in GI tract. Included in this family are the *Escherichia coli (E. coli), Klebsilla, Enterobactor, Citrobacter, Proteus and serratia species*. Other common pathogens include *Staphylococcus epidermidis, Staphylococcus saprophyticus* and *Enterococcus Species. E. coli* is the most predominant organism. The aim of this review is to summarize the distribution, clinical sign and symptoms, laboratory profile and risk factor of urinary tract infection.**

**Key words:** Urinary Tract infection (UTI), *E.coli,* Risk factors, Pregnancy, Recurrence.

Urinary tract infections (UTI) are the bacterial infections affecting humans throughout their lifetime. UTI represents one of the most common diseases occurring in all groups' women encounters in medical practice today. UTI is most serious global health issues in 21st century (Morris and Masterton, 2002). They are the frequent cause of morbidity in outpatients as well as most frequently involved in the cause of nosocomial infection in many hospitals (Sussman and Hausler, 1998). Urinary tract infections (UTIs) are an infection caused by the presence and growth of microorganisms anywhere in the urinary tract and is perhaps the single commonest bacterial infection of mankind (Morgan and McKenzie, 1993; Ebie *et al.*, 2001). Urinary tract infection is the second most common infectious presentation in community medical practice. Worldwide, about 150 million people are diagnosed with UTI each year, and UTI are classified as uncomplicated or complicated (Stamm and Norrby, 2001). UTI is a serious ailment in human due to increasing frequency, recurrence and difficulty in eradication; it poses stiff challenge to the medical professionals. It is much more common in women than in men, due to anatomical and physiological reasons; by virtue of its position

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urinogenital tract is more vulnerable to bacterial infections caused by both internal and external flora (Maripandi *et al.,* 2010). The population at risk of UTI includes new born (including the premature), mature girls, sexually active females and elderly females. About 3% of all women in the United States visit a physician at least once each year for UTIs, and at least 50% of women report at least one UTI in lifetime (Nicolle *et al.,* 2006). UTI can lead to renal scars and if undiagnosed leads to permanent renal damage causing hypertension or end stage renal disease. The diagnosis of UTI is difficult in the neonatal period because the signs and symptoms are no specific in this age group. The incidence in the neonates is 0.01% - 1% and an also be as high as 10% in low birth weight and preterm babies (Bivikli *et al.,* 2004).

**Objective of the review**

The objective of this review is to collate, summarize and critically appraise the published evidence on the urinary tract infection and assess the evidence for existing risk factor such as recurrence, socio economic status, diabetes, contraception uses and unhygienic practices pregnancy, anemia etc.

**UTI Pathogenesis**

*Escherichia coli (E. coli)* is the most common uropathogen of all forms of UTI (Heilberg and Schor, 2003; Batista, 2002), and is responsible for 80% of cases (Duarte *et al.,* 2002). The commonest urinary pathogen accounting for over 80% of community-acquired infection is due to *E. coli*. However, other organisms gain a greater foothold in patients with complicated UTI (Mathai *et al.,* 2001). *Enterobacteriaceae* and *E. coli* in particular are the notorious pathogens (Naber *et al.,* 2008) causing infections by adhering to, invading, and replicating the umbrella cells of the bladder epithelium (Wagenlehner *et al.,* 2005). *E. coli* replication is facilitated by inflammation, leading to increased bacterial survival and invasion to the deeper layers of the urothelium. Consequently, these urothelial cells become reservoirs in which pathogens persist in a quiescent state becomes reservoirs and may be the source of recurrent UTIs. In general practice, there are concerns that some common infections are becoming increasingly difficult to treat and that complications due to antibiotic resistant bacteria may take longer to resolve. The distribution of urinary pathogens in hospitalized patients is differs with *E. coli* accounting for about 50% of infections. *Enterococcus, Klebsiella, Enterobacter, Citrobacter, Serratia, Pseudomonas aeruginosa, Providencia, and Staphylococcus* epidermidis account for most of the rest (Bryan and Reynolds.1984). It is notable that, in women, the colonization of the vaginal and periurethral mucous can precede UTI (Heilberg IP, Schor, 2003), the infection can ascend, causing cystitis and, if not treated, pyelonephritis. Suprapubic vesical puncture permits diagnosis confirmation of urinary tract infection, at any quantity of identified colonies. However, as it is an invasive examination, it is not normally used. Thus, the gold standard urine culture is considered for investigation of UTI (Duarte *et al.,* 2002).

Aerobic non-fermenting gram-negative bacilli (non-fermenters) are a heterogeneous group of organisms that are either incapable of utilizing carbohydrates as a source of energy or degrade them via oxidative rather than fermentative pathway (Koneman *et al.,* 1988). Risk factors include immune suppression, trauma, foreign body, broad-spectrum antibiotic use, infused body fluids like saline irrigations and also urinary catheterization when infections are caused by these pathogens (Katsumi *et al.,* 2006). UTIs are often treated with different broad-spectrum antibiotics, one with a narrow spectrum of activity may be appropriate because of emerging concerns about infection with resistant organisms, and antimicrobial susceptibility testing of the urinary pathogens constitutes the basis for antibiotic therapy. However, in view of the increasing bacterial resistance, regular monitoring of resistance patterns is necessary to improve guidelines for empirical antibiotic therapy (Kripke, 2005).

Multiple drug resistance in human pathogenic microorganisms has been developed due to indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious diseases. The development of antibiotic resistance is multi factorial, including the specific nature of the relationship of bacteria to antibiotics, the usage of antibacterial agent, host characteristics and environmental factors. This situation has forced scientists to search for new antimicrobial substances from various sources as novel antimicrobial chemotherapeutic agents, but

the cost production of synthetic drugs is high and they produce adverse effects compared to plant derived drugs (Abiramasundari *et al.,* 2011).

**Classification**

UTI, defined as the adherence of bacteria to the urinary tract walls, affects nearly 10-12% of pregnancies, and is the third highest clinical occurrence during this period (Jacociunas *et al.,* 2007). The symptomatic urinary tract infection can be uncomplicated or complicated. Uncomplicated urinary tract infection is a symptomatic urinary tract infection characterized by frequency, urgency, dysuria, or supra pubic pain in a woman with a normal genitourinary tract (Hooton and Stamm, 1997).

UTIs can occur as asymptomatic bacteriuria, acute cystitis and acute pyelonephritis (Batista, 2002). The presence of bacteria without clinical symptoms characterizes asymptomatic bacteriuria, which occurs in almost 5% of pregnant women (Batista, 2002). The importance of asymptomatic bacteriuria is related to the possibility of an evolution to clinical urinary infection in 40-60% of cases, premature labor and hospitalization of pregnant women (Jacociunas *et al.,* 2007). Complicated urinary tract infection, is also a symptomatic urinary infection in a women with functional or structural abnormalities of the genitourinary tract which involve either the bladder or kidneys (Nicolle, 2001) Considering the complete absence of symptoms and the possibility of a silent evolution to urinary infections high in the tract, with negative repercussions in perinatal results, active search and treatment of asymptomatic bacteriuria in pregnant women is recommended (Nicolle, 2005). Acute cystitis compromises the urethra and, mainly, the bladder. It presents symptoms typical of the lower urinary tract, such as dysuria, pollakiuria, nocturia and suprapubic pain when urinating (Nicolle, 2005).

**Symptoms**

UTI were verified by burning or pain, dark urine, strong smell and urination urgency (Danielle *et al.,* 2009). Complicated or Recurrent UTIs occur in patients with any anatomic, structural or functional abnormality that compromises therapy. Fever and chills are common along with other systemic symptoms and broad spectrum therapy is required (Mohsin *et al.,* 2010).

**Examination of urine**

Regarding the results of examinations, for simple urine test it was observed: nitrite, protein, glucose, ketone bodies, bilirubin, bile pigments, blood, leukocyte esterase, more than four leukocytes per field, more than two red blood cells per field, abundant epithelial cells and crystals; for urine culture (positive, negative)and isolated microorganism (Danielle *et al.,* 2009).

**Recurrence**

Recurrent urinary tract infections (UTIs) present a significant problem for women (Mohsin, 2010). One in four women with UTI will suffer from recurrences, in healthy, young or pre-menopausal women the most common risk factor is sexual intercourse. Recurrent urinary tract infection (RUTI) is defined as three episodes of urinary tract infection (UTI) with 3 positive urine cultures in the previous 12 months or two episodes in the last six months (Albert *et al.,* 2004). Treatment of recurrent urinary tract infections (UTI) in female is one of the most difficult challenges for the physicians, affecting about 25% of women with a history of isolated urinary tract infection (Schappert, 1994). The urinary tract is normally sterile; bacteria that generally ascend from the peri-anal area reservoir may cause UTIs. Bacteria in the urinary tract may remain asymptomatic or cause irritative symptoms such as frequency and urgency. If untreated, the infection may ascend to the upper urinary tract and produce fever, chills, and flank pain. Bacterial entry into the blood stream is associated with severe morbidity, including sepsis and death (Mignini *et al.,* 2009).

**Socio-demographic variables**

Socio-demographic variables were: age, marital status (married, single, cohabitating and others), educational level and occupation (Foxman, 2002). Investigated pregnant women were young, presenting average and median age of 25 years and 70% were primiparous women or had only one living child, evidencing low parity. Maternal educational level, an indicator frequently associated with a family's socio-economic level, showed a relatively unfavorable situation, since 44.7% of pregnant women had at most completed their elementary education. Most of them did not perform any paid activity (54.3%). In this study, there was no association between age, educational

level and multiparity with UTI. Analysis of the obstetrical background shows that 19.5% of patients had a history of abortion and 21.8% of previous cesarean section, values below the national average, which is around 31% for abortion and 40% for cesarean section(Ministério, 2008).

**Risk factors**

**Pregnancy**

Stenqvist et al found that the frequency of bacteriuria increases by about 1% during pregnancy. He also confirmed that the risk of acquiring bacteriuria increases with the duration of pregnancy from 0.8% of bacteriuric women in the 12$^{th}$ gestational week to 2% at the end of pregnancy (Stenqvist *et al.,* 1989) but Kutley et al stated that the prevalence of asymptomatic bacteriuria in pregnancy varies from 4-7% (range 2-11%) and it is similar to that observed in non-pregnant women (Kutlay *et al.,* 2003).

**Complication in Pregnant Women**

The lack of treatment or improper treatment of UTIs can lead to obstetric and neonatal complications. Among them, the early rupture of membranes, premature delivery and labor, restriction of intrauterine growing, low birth weight, abortion and fetal death are highlighted (Jacociunas *et al.,* 2007). Other complications have been associated with UTIs: hypertension, preeclampsia, anemia, chorioamnionitis, endometritis, septicemias (Schieve *et al.,* 1994) and deterioration of kidney function (Nicolle, 2005).

**Socio Economic Status**

Prevalence is higher among lower socio economic classes (Wesley *et al.,* 2002). Kiningham *et al.,* 1993 reported that low socio- economic status, sickle cell trait, diabetes mellitus and grand multi parity predispose to urinary tract infection, and each is associated with two-fold increase in the rate of bacteriuria.

**Anemia**

Bacteriuria in pregnancy was associated with maternal anemia (Kremery *et al.,* 2001; Lavanya *et al.,* 2002) also found that bacteriuria in pregnancy was associated with maternal anemia. But Fatima et al 2006 reported that there is no any association between bacteriuria and anemia.

**Diabetes**

Systematic review and meta-analysis of published data since 1966 to evaluate whether asymptomatic bacteriuria (ASB) is more common in patients with diabetes than among control subjects. Out of twenty-two studies which fullfilled the inclusion criteria, they found that ASB was present in 439 of 3,579 (12.2%) patients with diabetes and in 121 of 2,702 (4.5%) healthy control subjects (Renko *et al.,* 2011). ASB was more common both in patients with type 1 diabetes and type 2 diabetes than in control subjects. The prevalence of ASB was higher in both women and men as well as in children and adolescents with diabetes than in healthy control subjects. They concluded that the prevalence of ASB is higher in all patients with diabetes compared with control subjects.

The prevalence of UTI and risk factors for asymptomatic bacteriuria (ASB) in women with and without diabetes. A total of 636 nonpregnant women with diabetes (type 1 and type 2) who were 18–75 years of age and had no abnormalities of the urinary tract, and 153 women without diabetes who were visiting the eye and trauma outpatient clinic (control subjects) were included. We defined ASB as the presence of at least 105 colony- forming units/ml of 1 or 2 bacterial species in a culture of clean-voided midstream urine from an individual without symptoms of a urinary tract infection (UTI). And found that the prevalence of ASB was 26% in the diabetic women and 6% in the control subjects (P = 0.001). The prevalence of ASB in women with type 1 diabetes was 21%. The prevalence of ASB was 29% in women with type 2 diabetes. They concluded that prevalence of ASB is increased in women with diabetes (Geerlings *et al.,* 2000).

**Sexual Activity**

Buckley et al, 1978 found that 30% of women have at least one log increase in bacteria in the bladder immediately following sexual intercourse. Women who have been sexually active within the past month are six-times more likely to 2000) and woman with a new sexual partner also has an increased risk of infection (Scholes *et al.,* 2005).

**Contraception**

**Women who use spermicides for birth control have an increased vaginal pH and increased**

colonization with potential uropathogens, particularly *E. coli* (Gupta *et al.,* 2000). Such type of women have five-time greater rate of infection compared with women who do not use spermicide. There is a dose–response relationship between

frequency of spermicide use and infection. Vaginal flora is predominant in lactobacillus normally .The organisms produce hydrogen peroxide and maintain an acidic milieu in the vagina, which prevents colonization (Hooton *et al.,* 1996). Foxman *et al.,* 2000 found that diaphragm use may also contribute to infection, irrespective of concomitant spermicide use, but as most diaphragm users also use spermicide it is difficult to quantify the additional risk attributable to the diaphragm. The birth control pill or condom without spermicide is not associated with increased urinary infection.

**Catheterization**

Cope *et al.,* 2009 reviewed all urine culture results at a veterans affairs medical center during a 3-month period. 280 episodes of culture proven catheter-associated bacteriuria occurred during 3 months of study. Out of 280, 164 cases were asymptomatic.

**Unhygienic Practices**

Estimates of the prevalence of methods of management vary greatly across contexts but studies report widespread use of unsanitary absorbents, and inadequate washing and drying of reused absorbents across Africa, South East Asia and the Middle East. Studies in Africa have found use of sanitary pads as low as 18% amongst Tanzanian women with the remainder using cloth or toilet paper (Baisley *et al.,* 2009). Studies of Nigerian schoolgirls have found between 31% and 56% using toilet tissue or cloth to absorb their menstrual blood as oppose to menstrual pads (Adinma and Adinma, 2008; Aniebue *et al.,* 2009). A study of women in Gambia found that only around a third regularly used sanitary pads. (Demba *et al.,* 2005). Studies in India have found between 43% and 88% of girls washing and reusing cotton cloth rather than using disposable pads (Dasgupta and Sarkar, 2008; Narayan *et al.,* 2001). It has been found that cleaning of cloths is often done without soap or with unclean water and drying may be restrictions and taboos. These practices may lead to reuse of material that has not been adequately sanitized (Narayan *et al.,* 2001). Across studies problems are found to be particularly acute in rural areas and amongst women and girls in lower socio-economic groups.

**Antibiotic Resistance**

One of the most prevalent problems faced by healthcare services is the increasing prevalence of antimicrobial resistance. From these microbes resistant to antibiotics, Methicillin-resistant Staphylococcus aureus (MRSA) is a major cause of nosocomial infections. MRSA infections are very difficult to cure because MRSA strains are resistance against almost all clinically available antibiotics. For most MRSA strains, glycopeptide-type drugs such as vancomycin are the only effective antimicrobial agents. However, vancomycin-resistant S. aureus (VRSA) has been reported (Adwan and Mhanna, 2008).

Multidrug-resistant Enterobacteriaceae, mostly *E. coli*, produces extended-spectrum â lactamases (ESBLs) such as the CTX-M enzymes. These enzymes were named for their greater activity against cefotaxime than other oxyimino-beta-lactam substrates such as ceftazidime, ceftriaxone, or cefepime have emerged within the community setting as an important cause of urinary tract infections (UTIs). Recent reports have also described ESBL-producing *E. coli* as a cause of bloodstream infections associated with these community-onsets of UTI (Darwish and Aburjai, 2010).

## CONCLUSION

UTIs are some of the most frequent clinical bacterial infections in women. UTIs are mainly caused by re-infection by the same pathogen. Women with UTIs need to be properly investigated by urinalysis, urine cultures and other radiological techniques in order to rule out causes of recurrence, as well as to assess possible anatomical or functional urinary tract abnormalities. To conclude the prevalence rate of uncomplicated UTI in general practice is high among young females in reproductive age groups. Complicated UTI is more common in extremes age in females. Predominant risk factors to complicated UTI include diabetes mellitus, and recurrent UTI. Use of diaphragm with spermicidal and alteration of vaginal flora and sexual activity are the risk factors in young females. Pregnant women are more prone to the risk of UTI. *E. coli* was found to be the most common cause of UTI in all age groups.

**Future perspectives**

Though there are many papers focused on UTI and its risk factors in women, there are still many problems that need to be studied.

Examination of better ways to diminish risk factors into associated with UTI. Management strategies remain to be pursued in many major problems especially against pregnancy, diabetes, anemia, etc. Raising awareness regarding UTI and risk factors has remained largely a neglected area in terms of research, despite its increasing popularity amongst public health organizations. Moreover, further investigations in this area, in particular with regard to microorganism resistance mechanisms against this compound, are warranted. With this review we hope we have provided some basis for those planning future research in this area. Our aim was to collate the available evidence and to critically appraise it not for purely academic purposes but to highlight the strengths and weaknesses of studies related to this topic and to motivate other community life to improve future which is of relevance to many millions of women

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