

The Relation between Genital Hygiene Behaviors in Women and Urinary Tract Infection in Any Period of Life: Review Article

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ABSTRACT

Background: Urinary tract infections (UTIs) occur in one out of every 3 females, with a significant recurrence rate that can lead to renal impairment (RI) and kidney damage. RI is a condition that diminishes quality of life and elevates mortality risk. The female vaginal region possesses its own flora. Excessive or improper genital hygiene methods will disturb this flora, facilitating the colonization and proliferation of infections. An increased risk of urogenital infection is associated with women's anatomy, specifically the short urethra and the close proximity of the urethral meatus to the anus and vagina.

Objective: This study aimed to throw the light on the relation between genital hygiene behaviors in women and urinary tract infection in any period of life.

Material and methods: We searched Google Scholar and PubMed, Science Direct, and other internet databases for Genital Hygiene Behaviors, Women genitalia and Urinary Tract Infection. Only the latest or comprehensive study from 2012 to January 2024 was included, while the authors additionally assessed references from pertinent literature. Languages other than English have been excluded because of the dearth of translation sources. Oral presentations, dissertations, conference abstracts, and unpublished articles were excluded since they did not pertain to significant scientific studies.

Conclusion: Genital hygiene is a crucial practice for preventing genital infections and their potentially serious consequences. Personal hygiene practices are essential for the management of numerous infectious disorders. Genital hygiene is a crucial aspect of women's health and is essential for safeguarding reproductive health. Certain genital hygiene techniques employed by women may influence their vulnerability to sexually transmitted infections and the incidence of other reproductive health conditions. Vaginal douching, commonly employed for female genital cleanliness, alters the vaginal chemistry, disrupts the healthy flora, and elevates the possibility of infections. Urinary tract infections were more prevalent among individuals who regularly engaged in vaginal douching. There exists a substantial correlation between urinary tract infections and vaginal douching. However, alterations in vaginal flora diminish its resistance to pathogenic bacteria, facilitating their colonization. These colonizing bacteria induce urinary tract infections. The etiologies of urinary tract infections encompass recent utilization of antimicrobial agents, vaginal operations, and irregular administration of antibiotics following these interventions.

Keywords: UTI, Renal impairment, Vaginal flora.

INTRODUCTION

Urinary tract infections (UTIs) occur in one out of every 3 females, with a significant recurrence rate that can lead to renal impairment and kidney damage. Renal impairment is a condition that diminishes quality of life & elevates mortality risk. Additionally, the expense of renal impairment to nations is substantial. Consequently, safeguarding individuals against urinary tract infections will reduce UTI-related renal impairment, thereby enhancing the quality of life ⁽¹⁾.

Excluding inherited variables and chronic disorders, implementing daily living modifications is crucial for infection control. Adherence to sanitary regulations is one of them. Hand hygiene is recognized as an effective technique for infection control & prevention. Developing the habit of handwashing is beneficial not only for preventing urinary tract infections but also for safeguarding against all infections. Hand washing before and after toilet use can mostly prevent urogenital infections. Proper hand hygiene can diminish the likelihood of urogenital infection by eliminating bacteria. While, individuals who neglect handwashing prior to using the toilet exhibited a greater incidence of urinary

tract infections, this correlation lacked statistical significance ⁽²⁾.

The female vaginal region possesses its own flora. Excessive or improper genital hygiene methods will disturb this flora, facilitating the colonization and proliferation of infections. An increased risk of urogenital infection is associated with women's anatomy, specifically the short urethra & the proximity of the urethral meatus to the anus & vagina. This can lead to an infection in the ascending urethra and urine system contamination ⁽³⁾.

Patients who cleaned the vaginal area from back to front exhibited a statistically significant higher incidence of urinary tract infections compared to those who cleaned from front to rear. Following the cleansing of the perineum with water, it must be dried to inhibit the proliferation of microorganisms. Drying must be performed from front to back to prevent the contamination of the anal region into the urethra & vagina ⁽⁴⁾.

Cultural, economic, and individual variables influence the selection of absorbent materials during menstruation. The utilization of ready-made pads during

menstruation results in less genital infections compared to diapers. However, everyday pad usage may elevate the risk of infection. The frequency of changing menstrual pads may vary depending on the volume of flow. The frequency of pad changing diminishes on days with reduced bleeding. The humid, warm, & sanguine environment created by the collection of menstrual blood in the pads fosters microbial development and heightens the risk of infection. The difference in UTI rates between individuals using non-pad materials throughout menstruation & those use daily pads wasn't statistically significant, despite the elevated urinary tract infections incidence ⁽⁴⁾.

Vaginal douching, commonly employed for female genital cleanliness, alters the vaginal chemistry, disrupts the healthy flora, and elevates the risk of infections. Urinary tract infections were more prevalent among individuals who regularly engaged in vaginal douching. There exists a substantial correlation between urinary tract infections and vaginal douching. However, the avoidance of vaginal douching is listed in health guidelines as a strategy for UTI prevention ⁽⁵⁾.

A body bath, as a personal hygiene technique, facilitates genital cleanliness. Women who regularly shower do not need additional products for genital hygiene. Occupying contaminated feces during showering may result in vaginal and urinary tract infections. Individuals who bathed demonstrated a higher prevalence of UTI ⁽⁶⁾.

Women often deal with UTI and urine incontinence, which can have a negative impact on their quality of life and cause serious complications. People who experience urine incontinence often find that their undergarments become contaminated over time. UTI can be caused by microbes that easily multiply in the urethra. However, using a pad all the time because you're worried about urine incontinence can cause discomfort and infection. During menopause, urine incontinence can be a sign of dysfunction in the urinary system or a risk factor for recurrent UTIs ⁽⁷⁾.

A substantial correlation exists among gynecological surgery and urinary tract infections (UTIs). Numerous improper genital hygiene practices, including failing to wash hands before using the toilet, excessive vaginal douching, utilizing non-pad materials throughout menstruation, employing daily pads, & engaging in bathing & sitting, were prevalent among individuals with urinary tract infections. Practicing genital hygiene is crucial for person's health, well-being, & social welfare. Genital infections can negatively impact women's sexual and familial relationships, diminish quality of life, and lead to social isolation ⁽⁸⁾.

A significant number of women avoid addressing issues related to their reproductive organs or consulting healthcare specialists. Consequently, during the

anamnesis of individuals presenting with UTI, inquiries on genital hygiene behaviors may be conducted, and recurrence of urinary tract infections can be mitigated by precise information. Consequently, all healthcare practitioners, particularly physicians, are obligated to enhance public awareness by conducting training to disseminate proper hygiene habits. Consequently, conducting genital washing from posterior to anterior and undergoing gynecological procedures have been correlated with the incidence of urinary tract infections. Implementing training to disseminate appropriate hygiene practices for UTI prevention will reduce infection rates by enhancing societal awareness ⁽⁹⁾.

GENITAL HYGIENE

In order for women to feel safe in social situations and to prevent sexually transmitted diseases (STDs), it is essential that they practice good genital hygiene. Every person takes care of themselves by following their own set of habits, beliefs, and knowledge when it comes to genital hygiene. Both the frequency and the mode of execution of these behaviors differ from one person to the next. To protect women's health, it is vital to implement genital hygiene habits in terms of frequency & quality ⁽¹⁰⁾. Genital hygiene is a crucial practice for preventing genital infections and their potentially serious consequences. Personal hygiene practices are essential for the management of numerous infectious disorders. Genital hygiene is a crucial aspect of females' health & is essential for safeguarding reproductive health. Certain genital hygiene techniques employed by women may influence their vulnerability to STIs & the incidence of other reproductive health conditions. Furthermore, women's intimate cleanliness is a critical focus for healthcare women & professionals to enhance overall hygiene & personal health. The hygiene of the genitalia is a key factor in preserving women's health. In addition to the numerous factors that contribute to vaginal infections, genital cleanliness is acknowledged as an essential practice for disease prevention in the intimate female region ⁽¹¹⁾.

Genital infections can impair quality of life & lead to social isolation, adversely impacting women's sexual and familial relationships. The etiologies of vaginal infections in women are highly varied. The closeness of the urethra, vagina, and anus is the primary factor predisposing individuals to genital infections, compounded by personal variables that elevate the risk, including a woman's practices on personal and genital hygiene. Annually, over 100 million women globally encounter vaginal infections that may lead to vaginitis, cervicitis, urethritis, and trichomoniasis, which are linked to negative pregnancy outcomes. Bacterial infections frequently affecting women are attributed to bacterial vaginosis and candidiasis ⁽¹²⁾.

Genital hygiene is a crucial element in safeguarding reproductive health. Infection may arise from diminished acidity, inadequate menstruation hygiene, utilization of reusable clothes, personal unsanitary habits, prolonged moisture in the vaginal region, employment of contaminated towels, and the wearing of tight, non-absorbent undergarments. The 2017 Indonesian demographic and health survey revealed that the prevalence of sexually transmitted infections (STIs) and associated symptoms among sexually active married individuals was 14% in women and 2% in men. STIs are more prevalent in women due to the increased vulnerability of the female reproductive system to infections, as well as the necessity of considering genital cleanliness practices during menstruation. Reproductive health issues in women predominantly occur in poor nations, such as Indonesia ⁽¹³⁾.

Several researches have been conducted in the past to investigate the connection between proper genital hygiene and the prevalence of female genital infections. Several studies have demonstrated that one of the risk factors that contribute to the development of female genital diseases, including cervical cancer and other sexually transmitted infections, is the presence of poor genital hygiene behaviors. Research is currently being carried out by the researchers in order to determine the factors that influence the behaviors of females about genital cleanliness. There are a lot of ladies who are embarrassed to talk to those who work in the medical field. Due to social ideas and taboos, people are uncomfortable discussing this topic in public where they are exposed to it ⁽¹⁴⁾.

The role of a spouse is also crucial for a wife, as research indicates that he can offer assistance in enhancing health and preserving the harmony of a family. The mental health of a partner will be enhanced, tension will be reduced, and the partner will receive financial and emotional support from their husband. Individuals who perceive stress as a significant factor in their health are inclined to modify their behaviors in order to enhance their well-being; they are inclined to engage in behaviors that are inconsistent with healthy habits. Additionally, social media exposure is a significant factor in an individual's pursuit of information to enhance their sanitation practices. In the present day, information is readily accessible through the internet and social media, as technological advancements become more sophisticated ⁽¹⁵⁾.

Protection from infections

Intrinsic defensive mechanisms that defend against vulvovaginal infections include vaginal discharge, vaginal flora that is normal, and a vaginal pH that is acidic. In order to stick to the vaginal mucosa and keep the pH acidic, resident bacteria compete with outside

infections. Additionally, they produce bacteriocin and other antimicrobial chemicals to fight against infections. Testing of five women's vaginal secretions revealed in vitro action against non-resident bacterial species, including group B Streptococcus & Escherichia coli. Pregnant women must take extra precautions to avoid contracting group B Streptococcus, a kind of bacteria that can enter the vagina through the GI tract & increase the possibility of premature delivery, neonatal meningitis, and fetal death. Not only can it cause postpartum endometritis, but it can also lead to asymptomatic bacteriuria, UTIs, and UGTs ⁽¹⁶⁾.

The research of pregnant women found that higher vaginal pH, in the absence of a current vaginal infection, was strongly linked to premature birth, presenting obstetrical problems. In a large population-based investigation, increased vaginal pH was linked to a thirty percent heightened possibility of infection with various types of human papillomavirus (HPV) & low-grade squamous intraepithelial lesions (LSILs) ⁽¹⁷⁾.

Post-menopause, as estrogen levels decline, vaginal pH rises, resulting in an alkaline environment that is linked to heightened colonization by pathogenic microorganisms. Vulvar dermatoses are more common with menopause. The significance of vaginal lactic acid must be underscored, as it is linked to vaginal health, suppresses the proliferation of bacteria related to bacterial vaginosis, & may contribute to local immunological response. Vaginal epithelial cells generate many antibacterial substances, such as lysozyme and lactoferrin, while the fast turnover of the vaginal epithelium functions as an additional defense mechanism. Various components, such as Toll-like receptors, surfactant protein A, the complement system, β -defensins, & nitric oxide, play a crucial role in the female genital tract's innate and adaptive immunity, according to recent studies ⁽¹⁶⁾.

Intimate feminine hygiene

Numerous factors influence feminine hygiene practices, encompassing personal preference as well as cultural and societal issues. Despite its prevalence among women, vaginal douching has no verified health advantages and may compromise innate immune responses by disrupting natural vaginal flora, hence increasing susceptibility to infections. There is evidence that vaginal douching increases the likelihood of developing pelvic inflammatory disease, endometriosis, as well as the accumulation of vaginal discharge, sweat, urine, and feces can lead to an unpleasant body odor, thus it's important to clean the vulva regularly to avoid this. Although vulvar cleaning can be an effective supplementary method to medical treatment, it is not meant to treat infections. Despite this, there was a rise in personal products of hygiene aimed at odor control and cleanliness. Nevertheless, some of these products have

the potential to alter the vulvovaginal pH, which in turn affects the make-up of the beneficial microbiota that plays a key role in infection prevention ⁽¹⁸⁾.

Guidelines on feminine hygiene: ⁽¹⁶⁾

- The majority of women who suffer from vulvar disorders (e.g., vulvovaginitis, contact dermatitis) require guidance on the proper care of their vulvar skin and the prevention of contact irritants.
- The use of water to wash can exacerbate irritation and result in dry skin. Clean the vulva with a small quantity of water and detergent substitute.
- Clean the vulva only once a day, rather than bathing. Overcleaning can exacerbate vulvar symptoms, such as those associated with contact dermatitis. Utilizing an emollient may prove advantageous.
- Refrain from employing sponges or flannels. Utilize your forearm. Use a soft towel to gently wipe the area dry.
- Utilize undergarments that are loose-fitting, such as silk or cotton. Refrain from wearing clothing that is too tight.
- Replace hosiery with stockings and wear loose-fitting trousers or skirts. It is possible to opt for long skirts without donning undergarments.
- Sleep without the use of undergarments.
- Refrain from using biological laundry powders and fabric conditioners. It is advisable to launder underwear in a non-biological laundry detergent on its own.
- Refrain from applying shower gel, soap, scrubs, infant bubble bath, wipes, deodorant, or douches to the vulva.
- Certain over-the-counter creams, such as infant or nappy creams, herbal creams (e.g., tea tree oil, aloe vera), and "thrush" treatments, may contain irritants.
- Avoid the frequent use of sanitary cloths or panty liners.
- The vulvar area should not be treated with antiseptics, whether in the form of a lotion or added to bath water.
- Utilize undergarments that are either white or pale in color. An allergy may be induced by dark textile dyes (e.g., black or navy). However, the likelihood of an allergic reaction is reduced when new lingerie is washed prior to use.
- Stop from using colored toilet paper.
- If you have a propensity to scratch your epidermis, refrain from wearing nail varnish on your fingernails.

VAGINAL HYGIENE PRACTICES

➤ **Washing**

Maintaining a clean vagina involves regular, gentle bathing on the outside of the vagina:⁽¹⁶⁾

- Clean the area with warm water every day.

- Avoid perfumed soaps & gels. The smells can irritate the area & will merely act as a mask to conceal an underlying issue that is creating the stink.
- Douching will not resolve vaginal odor or other issues, but may exacerbate them.
- After using the toilet, wipe from front to back. Even better, rinse with warm water to eradicate undesirable microorganisms before patting dry.
- Avoid shaving the entire pubic area, as this might create irritation. Cuts and nicks can potentially spread harmful microorganisms. The hair exists to protect the area, so if required, clip it back with scissors rather than a razor. Avoid using hair removal cream, which burns the hair and can be particularly harsh on the skin.
- **Vaginal douching** is the process of cleaning the vagina with a liquid solution and other substances. The majority of these substances are derived from herbal concoctions, commercial preparations, and home remedies that involve baking soda or vinegar, as well as spices like ginger, lime, salt, or lemon ⁽¹⁹⁾.

The reason for vaginal douching remains consistent, despite the fact that it is a prevalent practice among women of varying cultural characteristics. Vaginal douching is the process of cleaning the vagina with a liquid solution and other substances. The majority of these substances are derived from herbal concoctions, commercial preparations, and home remedies that involve baking soda or vinegar, as well as spices like ginger and lime. Some of these methods include: removing stains from menstrual blood, making the vagina feel clean and fresh, preventing pregnancy and relieving itching, or narrowing the vaginal opening. Results showing an improvement in sexual pleasure and an improvement in vaginal discharge and odor have also been reported. Product ads for vaginal douches are to blame for the recent disturbing uptick in the practice among women. These goods are widely available in pharmacies and grocery stores, making them ideal for women who are in an urgent need of a product for feminine hygiene ⁽²⁰⁾.

SEX AND VAGINAL HYGIENE

Sexual intercourse is a healthy activity and should not be regarded as unhygienic. In reality, intercourse is particularly effective in preventing vaginal atrophy, particularly after menopause. Atrophy occurs when the vagina becomes drier, which increases the likelihood of tearing and causing discomfort. There are still some straightforward methods to prevent the development of infections following sexual intercourse: ⁽²¹⁾

- Replace condoms when transitioning between vaginal, anal, and oral intercourse to prevent bacterial transmission.
- Do not share sexual toys with your companion.

- Bacteria may occasionally enter the urethra during sexual intercourse. Post-coitus, ensure you urinate to expel bacteria and decrease the risk of acquiring a urinary tract infection.
- It is essential to shower or, at a minimum, cleanse the vulva with warm water after sexual activity and ensure it is thoroughly dried.

➤ **Clothing**

Maintaining optimal vaginal hygiene necessitates ensuring that the exterior pubic region (excluding the vagina) remains as dry as possible. Moisture can facilitate bacterial proliferation. Dress in clothes that allow the area to breathe ⁽²²⁾.

- Avoid wearing tight-fitting pants that limit air circulation in the vaginal area.
- Choose cotton underwear over synthetic fabrics. Cotton is more effective in absorbing moisture.
- Change your clothes and underwear after the gym.
- Avoid wearing a thong when exercising. The continual movement will bring anal bacteria into the vagina, resulting in infections.
- Avoid wearing damp swimsuits all day.
- Change underwear twice a day if experiencing excessive discharge to prevent sitting in damp underwear.

➤ **General vaginal hygiene:**

- Change pads, liners, and tampons at least four to five times per day. Washing or wiping the area on a regular basis may also be beneficial during the period. Avoid the perfumed versions of these products as well.
- Yogurt consumption may be beneficial for yeast infections. This product contains lactobacillus acidophilus, which is responsible for the production of the acidic environment that the vagina necessitates and for the suppression of yeast growth. Do not, however, insert yogurt into the vagina. The yeast's growth can be further boosted by the sugar in yogurt, which can exacerbate the infection. In addition, probiotics are an excellent source of lactobacillus and can be consumed on a daily basis. They are readily available at the local pharmacy.

✚ **Urinary tract infections (UTIs)**

UTI is the most prevalent bacterial infection during pregnancy. During pregnancy, a UTI is defined to encompass symptomatic infections of the bladder (cystitis) or kidney (pyelonephritis), in addition to asymptomatic bacteriuria, which is the presence of bacteria in the urine without accompanying symptoms. Review publications indicate a prevalence of 2 to 10% for asymptomatic bacteriuria, 1 to 4% for cystitis, and 1 to 2% for pyelonephritis during pregnancy. UTIs are frequently attributed to the ascendant migration of bacteria that inhabit the lower gastrointestinal and

genitourinary tracts, notably *Escherichia coli* or other gram-negative bacteria ⁽²³⁾.

ETIOLOGY

Host factors, inoculum size, and virulence of the infecting bug are a few of the numerous interacting variables that can lead to a urinary infection. Inoculation is the initial cause of a UTI. The ascending route theory is the most widely used in vaccination. Bacteria that are able to pass through the urethra and bladder have colonized the perineum. The likelihood of a urinary tract infection returning is dependent on a number of variables. One possible explanation at the microbiological level is that pathogenic enteric bacteria are more likely to colonize due to a decline in peroxide-producing lactobacilli. Some suggest that an individual becomes more susceptible to enteropathogenic infections due to a shift in the urothelium's glycosaminoglycan barrier, while others state that antibiotic-resistant bacterial intracellular clusters can form ⁽²⁴⁾.

Vaginal douching is the process of cleaning the vagina with a liquid solution and other substances. The majority of these substances are derived from herbal concoctions, commercial preparations, and home remedies that involve baking soda or vinegar, as well as spices like ginger and lime. Various variables contribute to the occurrence of rUTIs in women of different ages. Increased urethral and vaginal colonization is most commonly linked to increased sexual activity and spermicide use in young women. On the flip side, cystocele, atrophic vaginitis, and a large amount of urine residue are more common in older women ⁽²⁵⁾.

EPIDEMIOLOGY

The World Health Organization (WHO) estimates that infections during pregnancy contribute to 10.7% of maternal fatalities due to pregnancy globally. Recent studies estimate that around 28% of these infections are situated in the urinary tract. The primary factor predisposing women to cystitis and pyelonephritis during pregnancy may be asymptomatic bacteriuria (ASB). ASB is characterized by the presence of over 100,000 organisms/mL in a clean catch urinalysis from an asymptomatic individual. If ASB remains untreated during pregnancy, the incidence of future UTI is estimated to be around twenty-five percent. The prevalence of ASB in non-pregnant women is 5 to 6%, which is comparable to the predicted prevalence during pregnancy of 2% to 10%. ASB is more prevalent among parous women and those of poor socioeconomic standing. Female carriers of sickle cell trait exhibit a greater prevalence of ASB ⁽²⁶⁾.

Given the elevated incidence and possible severity of pyelonephritis, most prenatal guidelines advocate for the screening of all pregnant individuals for ASB early in

prenatal care, specifically during the first or second trimester. This procedure is often performed using a clean catch urine culture. Historically, the management of ASB was believed to reduce the incidence of clinical infection to 3% to 4%. Recent studies, intriguingly, fail to demonstrate that the treatment of ASB reduces the incidence of preterm birth and low birth weight. Additional research in this domain is required ⁽²⁷⁾.

Cystitis manifests in 1 to 2% of pregnant individuals. Pyelonephritis occurs in 1 to 2% of pregnant individuals, predominantly during the second trimester. Pyelonephritis is a prevalent etiology of severe infections, including septic shock, in pregnant individuals. It is the primary cause of the majority of medical hospitalizations during pregnancy. In one trail, 3.5% of antepartum admissions were attributed to urinary tract infections. Risk factors for pyelonephritis during pregnancy encompass obesity, low socioeconomic position, youth, nulliparity, diabetes, smoking, and history of recurrent urinary tract infections. Similar to ASB, certain people may be susceptible to infections and may disclose a history of ASB, pyelonephritis or cystitis. Pyelonephritis predominantly occurs on the right side, although it can be bilateral in up to 25% of instances ⁽²⁸⁾.

PATHOPHYSIOLOGY

A biofilm is a structured, encapsulated microorganism colony that has developed a polymeric matrix to protect & adhere to physiological structures, stones, or foreign bodies. Various pathogens of comparatively low virulence are also involved in biofilms, which can cause severe, potentially life-threatening infections. The invasion of tissues by bacteria is facilitated and a host response is elicited by urinary stasis as a result of dysfunctional voiding or obstruction. Biofilms are frequently linked to foreign objects, including catheters and stones. Catheters, in particular, provide bacteria with access to the urinary tract, & the biofilm subsequently safeguards the organisms from elimination. Biofilms frequently involve numerous organisms ⁽²⁹⁾.

Most antibiotics are ineffective at penetrating biofilms and treating the microorganisms within them. Biofilm bacteria exhibit delayed growth, diminishing the efficacy of antibiotics that are more efficient against quickly proliferating organisms. Irrigation & unobstructed urine flow may reduce biofilm formation, but they cannot entirely avoid it. The sole efficacious treatment is the excision and substitution of the impacted foreign object. Catheters that were in situ for one to two weeks or longer must be replaced prior to conducting urinalysis or urine culture to prevent contamination from the biofilm that has formed on the catheter. A comprehensive biofilm will develop on a urine catheter after approximately two weeks. Patients experiencing recurrent catheter-

associated urinary tract infections may benefit from more regular catheter replacements ⁽³⁰⁾.

DIAGNOSIS

All urinary tract infection cases can be categorized as either symptomatic or asymptomatic. An asymptomatic urinary tract infection is detected with urine findings. Meticulous sample collection is essential due to the anatomical position of the external urethral opening in females. The leukocyte count is the primary criterion employed in diagnosis of urinary tract infections; a value exceeding 10 leukocytes/mm³ indicates an infection. In pregnant cases, the threshold is elevated, exceeding twenty leukocytes/mm³. Contamination of samples by vaginal secretions including mucus and lactic acid bacteria may lead to inaccurate diagnoses of many mucus threads & excessive bacterial proliferation in urine sediment. Occasionally, the mucous can result in an erroneous diagnosis of proteinuria. Menstruation, postpartum hemorrhage, or any other uterine bleeding may lead to sample contamination with erythrocytes. In such instances, a comprehensive history and a more meticulously prepared repeat analysis are essential. Urinalysis results devoid of accompanying patient symptoms are inadequate to commence treatment. A urine culture can be utilized to validate or refute a notion of a UTI. The culture sample must be obtained in a sterile container to prevent contamination, ideally from the first morning urine. The detection of ≥ 105 colony forming units per milliliter (CFU/mL) indicates an infection, whereas an antibiogram will assess the effectiveness of a specific treatment ⁽²³⁾.

The presence of clinical symptoms in addition to increased leukocyte levels in urine sediment should prompt the commencement of treatment. Obtaining a culture sample at the beginning of treatment is recommended for pregnant patients due to the increased risk of premature delivery linked with UTI and the limited availability of antibiotic treatment choices that are compatible with pregnancy. The necessity for treatment will continue to be indicated by the typical symptoms. In over 90% of young women, the confirmation of an infection is facilitated by the presence of typical UTI symptoms in the absence of aberrant vaginal discharge and a burning sensation in the vulvar vestibule ⁽³¹⁾.

In fifteen percent of instances, urine cultures yield positive results despite a high leukocyte count in the urinalysis.

TREATMENT

Attention to antimicrobial stewardship is paramount in the management of patients with recurring infections. The physician must adhere to a treatment period of no more than 5 days for uncomplicated cystitis, since excessive treatment elevates resistance rates and contributes to recurrences by depleting beneficial flora. Due to the

likelihood of heightened antibiotic resistance, it is typically discouraged to treat asymptomatic bacteriuria in the general population. The overuse and misuse of antibiotics is largely responsible for the alarming rise in the detection of bacteria that are resistant to these drugs. Colon infections caused by *Clostridium difficile* have been linked to medicines used to treat UTIs, especially fluoroquinolones and cephalosporins. When it comes to simple cystitis, the IDSA does not recommend cephalosporins or fluoroquinolones as initial therapies. By changing the vaginal and periurethral protective flora, these classes increase recurrence rates and are associated with organisms that produce resistance and *E. septic shock* bacteria. However, the authors do acknowledge that these medications are necessary for bacteria that have developed resistance and for cases of complicated UTIs. So, while deciding how long to provide an antibiotic, doctors must take into account both the effectiveness of the treatment in curing the infection and the risk of side effects ⁽²⁴⁾.

VACCINES

Vaccines have been shown to potentially activate a patient's innate and humoral immune responses against urinary infections. Various formulations have been suggested, encompassing both vaginal and oral routes, with the oral formulation being the most prevalent and extensively studied. Uro-Vaxom, also known as OM-89, is an oral vaccination that contains 18 distinct strains of lyophilized *E. coli* lysates. A new meta-analysis on Uro-Vaxom has validated its effectiveness in treating recurrent urinary tract infections (rUTI). The prescribed administration strategy typically involves one capsule daily for 90 days as an induction treatment, followed by a cessation period of three months. For consolidation treatment, one capsule is administered daily for the first ten days of each month over a span of three consecutive months. Vaginal vaccinations are not yet utilized in clinical practice and lack sufficient evidence ⁽³²⁾.

Antimicrobial prophylaxis: ⁽²⁴⁾

- It is advised to make behavioral changes before starting continuous prophylaxis.
- A negative urine culture is needed for confirmation tests before continuous prophylaxis can be started.
- It is recommended to try non-antimicrobial measures before starting.
- Each patient should have their own unique antibiotic regimen.
- Women who engage in sexual activity should take postcoital prophylaxis.

Non-antimicrobial therapy:

- a. The rationale for non-antimicrobial therapy arises from two primary limitations of antimicrobial

prophylaxis for rUTI. The formation of resistant strains in urine and the inability to completely remove bacteria are critical factors to consider in any antimicrobial therapy ⁽³³⁾.

- b. Urinary alkalization has been suggested as a measure to reduce recurrent urinary tract infections. This is accomplished through the administration of alkalizing chemicals like potassium citrate. A Cochrane meta-analysis identified several trials utilizing urine alkalization to prevent urinary infections. Nevertheless, none of those investigations yielded a significant result to endorse such therapy ⁽³³⁾.
- c. An additional preventive therapy suggested is the use of *Lactobacillus* probiotics. The purpose is to establish a vaginal barrier against pathogenic microorganisms. Incongruous findings have been disseminated without definitive conclusions ⁽³²⁾.
- d. Cranberry has historically been linked to the management of recurrent urinary tract infections. It consists of shrubs from the subgenus *Oxycoccus* and exhibits antioxidative capabilities while blocking the adhesion of P-fimbriae from uropathogens to the urothelium. According to a 2012 Cochrane review, the incidence of UTIs in the subgroup of patients with recurrent cystitis was not significantly reduced by the use of cranberry products ⁽³⁴⁾.
- e. Topical estrogens have been thoroughly studied and demonstrated to reduce the incidence of rUTI. The decline in circulating estrogen due to age results in a reduction in vaginal *Lactobacillus* and an elevated risk of colonization by uropathogens, including enterococci and Gram-negative rods. Recent cochrane research indicates that topical estrogen reduces the incidence of recurrent urinary tract infections without elevating the risk of breast or endometrial malignancies in women. Nonetheless, it may cause local adverse effects such as discomfort. Conversely, systemic estrogens do not reduce recurrent urinary tract infection rates. Clinicians must consider contraindications while administering estrogen, including endometrial and breast cancers, thromboembolic events, and hepatic dysfunction ⁽³⁵⁾.

Ethical Consideration: The medication utilized in the investigation is confirmed by the Egyptian Ministry of Health. The Ethics Committee of the GOTH Research Centre approved the research protocol. Prior to enrollment, written informed consent was gathered from individuals or their legal representatives in accordance with the individual's condition. The purpose of this study was to perform research on humans in compliance with the Declaration of Helsinki, the code of ethics of the World Medical Association.

DECLARATIONS

- **Consent for publication:** I certify that each author has granted permission for the work to be submitted.
- **Funding:** No fund
- **Availability of data and material:** Available
- **Conflicts of interest:** No conflicts of interest.
- **Competing interests:** None.

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