

The Effect of Urinary Tract Infections in Elderly People with and Without Diabetes

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Abstract:- This study should provide a review focused on urinary tract infections (UTIs) in elderly patients with diabetes mellitus and without diabetes and to determine if UTIs are more complicated and severe in diabetics than non-diabetics. A common type of infection are urinary tract infections that can affect people of all ages, but they are especially common in elderly patients. Elderly patients with diabetes mellitus are at a higher risk of developing UTIs compared to elderly patients without diabetes mellitus. This is because people with diabetes are more susceptible to infections in general, and UTIs are no exception. This study showed that urinary tract infections are highly prevalent, with up to 50% of women experiencing at least one in their lifetime, especially women with diabetes mellitus, are at a higher risk of developing UTIs, which can cause significant morbidity and mortality, particularly in those with comorbidities.

Keywords:- UTIs, Elderly Patients, Diabetes Mellitus, Non-Diabetics, Pathogen Bacterias.

I. INTRODUCTION

Urinary tract infections (UTIs) are highly prevalent and common infections that occur when bacteria enter the urethra and infect the urinary system, usually originating from the skin of the rectum [1]. These infections can affect any part of the urinary tract, including the kidneys, ureters, bladder, and urethra. However, bladder infection, also known as cystitis, is the most prevalent form of UTI [2]. One of the contributing factors to the higher incidence of UTIs in women compared to men is the anatomical difference; women have shorter urethras, which are also located closer to the rectum, facilitating the entry of bacteria into the urinary tract [3]. Among elderly patients, UTIs remain one of the most common infections, making them a significant healthcare concern. They are not only the most frequent infection in both community-dwelling older adults and long-term care residents but also account for more than one-third of all nursing home-associated infections [4]. Both age and gender play a role in the incidence and prevalence of UTIs in the elderly population [5]. Additionally, studies have consistently shown that adult women experience UTIs more frequently than men [6][7]. Diabetes mellitus is a metabolic disorder that poses unique challenges in terms of susceptibility to UTIs. Diabetic patients are more prone to UTIs and are at an increased risk of developing complications such as

asymptomatic bacteriuria (ASB) and acute pyelonephritis [8][9].

Uncontrolled hyperglycemia is a major factor that impairs the overall immunity of diabetic patients through various mechanistic pathways, making them more susceptible to infections [10]. Regarding the causative pathogens, *Escherichia coli* bacteria is consistently the most prevalent bacteria extracted from urinary cultures in adults. Alongside *E. coli*, other organisms like *Klebsiella* spp., *Proteus* spp., *Enterococcus* spp., and *Staphylococcus* spp. are also frequently found [11][12]. Preventing and treating UTIs in diabetic patients requires a comprehensive approach, taking into consideration the patient's capacity for therapy compliance, living circumstances, pre-existing comorbidities, antibiotic resistance patterns, and the severity of the illness.

While antibiotics are the primary treatment for UTIs, the escalating issue of antimicrobial resistance calls for exploration of non-antimicrobial strategies [13][10]. One promising preventive measure is the use of cranberry juice, which has been shown to prevent bacterial adhesion to uroepithelial cells; consequently, the risk of infection is reduced. [14]. Additionally, the oral or vaginal administration of *Lactobacillus* is being investigated as a potential method to manage UTIs in diabetic conditions [10]. The main objectives of the article are to review previous work on urinary tract infections in elderly patients with and without diabetes mellitus, determine if UTIs are more common, complicated, and severe in diabetics compared to non-diabetics, identify the types of bacteria that cause UTIs and their antibiotic sensitivity, and explore treatment and prevention strategies for UTIs.

II. RESEARCH METHODOLOGY

The search engines Google Scholar, NCBI, PubMed, Scopus, and Web of Science were used for this research. All these databases are well-established, multi-disciplinary research platforms, holding a wide variety of peer-reviewed journals, and they are being kept up to date. Search temporal limits included papers published between 1994 and 2020 with the purpose of providing the most recent evidence regarding this issue. In these databases, the following keywords were searched: "urinary tract infections" or "UTI", "elderly patients", "diabetes mellitus", "diabetics", "non-diabetics", "pathogen", "treatment", and "prevention". During

the review of articles, related articles on this subject were reviewed.

III. RESULTS AND DISCUSSION

Urinary tract infections are a common and recurring medical concern, particularly among elderly patients. Notably, the risk of developing UTIs is even higher in elderly individuals with diabetes mellitus, especially among elderly women [15]. This increased susceptibility can be attributed to a combination of factors, including compromised immune function, poor glycemic control, diabetic neuropathy, and anatomical differences in women [15]. Type 2 diabetes, in particular, renders individuals more susceptible to various types of UTIs, encompassing those acquired in community or healthcare settings, catheter associated infections, and post-kidney transplant [13]. Moreover, diabetics are more likely to come into contact with pathogens that are resistant to antibiotics causing UTIs [13]. Candida-induced fungal UTIs are also more prevalent in people with type 2 diabetes [13]. Unfortunately, UTIs in elderly patients with diabetes may lead to more severe outcomes, such as extended hospital stays and higher mortality rates [13]. While the symptoms of UTIs in elderly patients with and without diabetes are generally similar and may include urinary urgency, frequency, pain, and incontinence, certain studies have indicated that elderly patients with diabetes may be more likely to experience asymptomatic UTIs, making diagnosis and treatment more challenging [15]. Moreover, this specific group of patients tends to develop severe and rare complications, underscoring the significance of timely and accurate diagnosis [15]. Complications of UTIs in elderly patients with diabetes are more concerning compared to those without diabetes and may include pyelonephritis, sepsis, and hospitalization. While the treatment of UTIs in both groups is generally similar, elderly patients with diabetes may require longer courses of antibiotics to achieve bacterial eradication, reflecting the importance of tailored therapeutic approaches [15]. To gain a comprehensive understanding of the mechanisms underlying the heightened susceptibility to UTIs in patients with diabetes, further clinical epidemiological studies are warranted [16]. Despite the increased incidence, prevalence, and severity of UTIs in diabetic patients, a lack of comprehensive data hinders the elucidation of the specific factors responsible for this heightened risk [16]. Given the escalated risks faced by diabetic patients, aggressive antibacterial treatment is recommended to combat UTIs effectively [16].

➤ *Complicated UTIs occur most commonly in older patients, especially females with diabetes mellitus.*

Urinary tract infections are among the most common, prevalent and challenging medical issues among elderly individuals, taking place in both community settings and long-term care facilities [17]. The spectrum of UTIs in elderly encompasses a wide range of manifestations, from relatively benign symptomatic bacteriuria to potentially life-threatening bacteremic infections, with a 28-day mortality rate of up to 5% reported in this vulnerable population [17]. Diagnosing UTIs in elderly patients can be particularly demanding as it is often made without the usual clinical

history, signs, and symptoms, leading to excessive diagnosis and treatment of the condition [17]. Studies have even suggested that nearly 40% of hospitalized elderly people receive incorrect UTI diagnosis. Given the increasing prevalence of healthcare-associated infections and antibiotic resistance, getting an accurate diagnosis, administering the proper antibiotics, and avoiding broad-spectrum agents become paramount [17]. The burden of UTIs in elderly patients, especially women, is substantial, with approximately half of all women experiencing at least one UTI during their lifetime [8]. While simple UTIs are more common in young, healthy adult women and can be easily treated, UTIs in other patient groups, especially elderly, can be more complicated, harder to treat, and prone to recurrence. Complicated UTIs predominantly affect patients with urinary system abnormalities, but advancing age over 65 years, immunosuppressive drug treatment, HIV infection, and diabetes mellitus also contribute to the heightened risk [8]. Detailed investigation of the incidence of asymptomatic bacteriuria and symptomatic UTIs in women with diabetes has revealed crucial risk factors. In type 1 diabetes, a longer duration of the disease, peripheral neuropathy, and macroalbuminuria are associated with a higher risk of ASB, while type 2 diabetes patients face greater risks if they are older, have macroalbuminuria, or have recently experienced a symptomatic UTI [8]. Surprisingly, diabetes regulation does not seem to influence the presence of ASB. Fascinatingly, sexual intercourse emerges as the most significant risk factor for UTIs in type 1 diabetes patients, while for type 2 diabetes patients, the primary risk factor is the presence of ASB [8]. It is believed that diabetic cystopathy and peripheral neuropathy play a crucial role in the pathogenesis of UTIs in diabetic patients. The link between diabetes and an increased susceptibility to infections has been recognized for over a century [9]. Patients with diabetes have a higher incidence of asymptomatic bacteriuria, acute pyelonephritis, and UTI complications compared to those without diabetes. Remarkably, UTIs are among the top ten concurrent or complicating illnesses experienced by individuals with diabetes over their lifetime [9]. While UTIs are a frequent concern in diabetic patients, optimal management strategies are yet to be fully understood [9]. Many treatment approaches lack solid evidence, emphasizing the need for healthcare providers and researchers to develop effective strategies to avoid inappropriate and potentially harmful treatments, inefficient resource use, and suboptimal patient care [9]. Furthermore, Geerlings et al. [15] established that women with diabetes mellitus are more likely to have asymptomatic bacteriuria and urinary tract infections than women without diabetes. The risk factors for ASB differ between type 1 and type 2 diabetes, with type 1 diabetes patients being influenced by a longer duration of diabetes, peripheral neuropathy, and macroalbuminuria, while type 2 diabetes patients face higher risks with advancing age, macroalbuminuria, and recent symptomatic UTIs [15]. On the other hand, poorly-controlled diabetes and residual urine after urination are not significant risk factors for UTIs [15]. Understanding the exact relationship between diabetes and infection is complex, considering the heterogeneity of diabetic populations [19].

While metabolic issues and long-term complications like neuropathy and nephropathy are suspected to contribute to the higher susceptibility to infections in diabetics, the specific factors remain incompletely understood [19]. Nonetheless, UTIs remain a significant concern in diabetic populations, often leading to more severe complications compared to non-diabetic individuals [19]. Regarding renal function and hypertension, Meiland et al. [20] investigated the relationship between asymptomatic bacteriuria and renal function development in women with type 1 or type 2 diabetes. Although ASB was prevalent in 17% of the study population, women with diabetes mellitus (DM) and ASB did not demonstrate a higher risk of rapid decline in renal function or hypertension development after six years of follow-up [20]. While some studies suggested type 1-fimbriated *E. coli* could lead to renal parenchymal scarring, long-term data linking ASB to the risk of renal failure in DM patients were not conclusively available [20].

➤ *A comparison focusing on UTIs in elderly patients with and without diabetes mellitus*

Numerous studies have delved into the incidence and risk factors for urinary tract infections in various patient populations, shedding light on the impact of diabetes mellitus on this prevalent medical issue. Ramrakhia et al. [21] conducted a study that revealed a significantly higher prevalence of UTIs in diabetic patients compared to non-diabetic patients. The most common culprit behind these infections was identified as *Escherichia coli*, a pathogen frequently associated with UTIs. This finding emphasizes the importance of monitoring UTIs in diabetic patients and underscores the need for effective prevention and treatment strategies. Ahmed et al. [22] explored the incidence of UTIs in elderly women over the age of 65. They found that the occurrence of UTIs increased with age, particularly in women. However, men also experienced a significant incidence of UTIs, highlighting the relevance of UTIs as a significant health concern in older adults of both genders. Wilke et al. [23] investigated the association between type 2 diabetes mellitus and UTIs. Their research revealed that patients with type 2 diabetes faced a higher risk of developing UTIs, especially if they had a history of previous UTIs and poor glycemic control. These findings underscore the importance of glycemic management in reducing the risk of UTIs among diabetic patients. Aswani et al. [24] focused on the microbial aspect of UTIs in diabetic patients. They reported that diabetics had a higher rate of *E. coli* isolation from urine cultures, further solidifying the link between diabetes and UTIs. Additionally, diabetic patients were found to have a significantly higher prevalence of extended-spectrum beta-lactamase producing *E. coli*, which could potentially complicate treatment regimens. Marques et al. [25] examined the impact of diabetes on UTIs in older women. Their study identified diabetes as a significant risk factor for UTIs in this population, with *E. coli* being the most common pathogen causing these infections. This reinforces the need for heightened UTI surveillance and tailored preventive measures for diabetic older women. Matthews et al. [26] highlighted the prevalence of UTIs among elderly women, categorizing them as the second most common infection in community-dwelling individuals and the leading

cause of infection in long-term care facilities and hospitalized patients. This emphasizes the substantial impact of UTIs in elderly populations and necessitates focused efforts to mitigate their consequences. Caljouw et al. [27] explored potential indicators of developing UTIs in the elderly. They identified the strongest indicators of increased UTI risk were severe cognitive impairment, disability in daily living, a history of UTIs, and self-reported urine incontinence. Such findings can aid healthcare providers in early detection and targeted interventions to prevent complications associated with UTIs. Boyko et al. [28] assessed the risk of acutely symptomatic UTIs in postmenopausal women, both with and without diabetes. Their research revealed that women with diabetes had a higher risk of developing UTIs. However, interestingly, no noticeable difference was observed in the type of microorganism causing UTIs between diabetic and non-diabetic women, highlighting the complexity of UTI pathogenesis in these patient groups. An array of studies has examined the relationship between diabetes mellitus and urinary tract infections in elderly patients and beyond. These research endeavors have contributed valuable insights into the increased susceptibility to UTIs among diabetic individuals and underscored the significance of early detection, management, and tailored preventive measures to address this significant medical challenge. The cumulative evidence presented in these studies emphasizes the importance of continued research and evidence-based approaches to optimize UTI care in both diabetic and non-diabetic patient populations.

➤ *Severity of UTIs - diabetics vs. non-diabetics*

Urinary tract infections pose a significant health burden among older adults, ranking as the second most frequent type of infection [29]. However, diagnosing and treating UTIs in elderly patients can be challenging due to various underlying factors, including age-related physiological changes, diabetes mellitus and spinal cord injuries are examples of comorbidities, catheterization, and general condition deterioration [29]. One of the key complexities in diagnosing UTIs in elderly patients is the presence of atypical symptoms, which can lead to diagnostic delays. Elderly individuals may not exhibit the classic signs of infection, necessitating keen observation and vigilance for any changes in their baseline health status [29]. In this population, unusual symptoms such as incontinence, nausea, vomiting, abdominal pain, respiratory distress, and changes in consciousness may accompany UTI diagnosis [29]. Several anatomical and physiological factors can predispose elderly patients to UTI development, further complicating their management. Conditions such as pelvic prolapse, cystocele, rectocele, bladder diverticulum, urinary reflux, incontinence, a lack of perineal hygiene, vaginal atrophy, estrogen deficiency in women, and prostate disease in men can create conducive environments for UTIs to thrive [29]. Recognizing the impact of UTI complications on elderly patients' outcomes, physicians must maintain a high index of suspicion for UTI diagnosis in geriatric patients. As a result, during clinical suspicion, pre-treatment urine culture and urinal dipstick tests are commonly performed [29]. The urinal dipstick test serves as a valuable tool for predicting values and guiding empirical antibiotic treatment, thereby reducing morbidity and

mortality associated with UTIs in older adults [29]. In the context of diabetes mellitus, UTIs present even more significant challenges and risks. Nitzan et al. [13] highlighted that individuals with diabetes type two are more vulnerable to developing various infections, with UTIs being one of the most prevalent among them. The pathogenesis of UTIs in diabetic patients is complex and may involve impaired immune function, diabetes has poor metabolic control, and autonomic neuropathy causes incomplete bladder emptying [13]. Hakeem et al. [30] further emphasized that infections in diabetic patients can manifest differently compared to non-diabetics, with some infections being more prevalent exclusively in individuals with diabetes. UTIs are a classic example, as patients with diabetes are more susceptible to asymptomatic bacteriuria, acute pyelonephritis, and UTI complications compared to non-diabetic patients [30]. Managing UTIs in diabetic patients requires a tailored approach, considering the complexities and complications they may encounter. While asymptomatic bacteriuria in diabetic patients does not lead to complications, symptomatic UTIs can result in more severe outcomes compared to non-diabetic patients [18]. As such, early diagnosis, prompt treatment, and vigilant monitoring are essential to prevent the progression of UTIs in diabetic individuals [18].

Despite the significance of UTIs in diabetic patients, there remains a lack of well defined, evidence-based antimicrobial treatment strategies, especially regarding the optimal duration of treatment [18]. Recurrence of UTIs in women with diabetes is a common issue, highlighting the need for more aggressive and tailored approaches to management [30][15].

IV. CONCLUSION

Urinary tract infections are highly prevalent, affecting up to 50% of women in their lifetime, with a significant impact on nursing homes and the elderly population, where they are the leading cause of bacteremia. *Escherichia coli* is the most common cause of uncomplicated UTIs, while complicated UTIs are often associated with antibiotic-resistant *Enterobacteriaceae*, *Enterococci*, and *Candida* species. Elderly individuals, particularly women with diabetes mellitus, are at a higher risk of developing UTIs, which can lead to substantial morbidity and mortality, especially when comorbidities are present. Thus, timely recognition, appropriate management, and preventive measures are essential to alleviate the burden of UTIs in the elderly, particularly those with diabetes mellitus.

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