Nursing Interventions in A Diabetic Patient with Urinary Tract Infection and Renal Complication

Bertha Alejandrina Vásquez-Morán[1], Mariuxi Johanna Zurita-Desiderio[2], Vilma Rocío Quijije-Chavez[3], Fanny Isabel Arteaga Ortega[4]

[1,2,3,4] *Universidad Técnica Estatal de Quevedo*

KEYWORDS

Kidney Complication, Diabetes, Geriatric.

ABSTRACT

Urinary tract infection (UTI) is a common condition caused by the entry of bacteria or other infectious agents into the urinary system. If not properly treated, it can lead to serious renal complications, such as pyelonephritis, a bacterial infection of the kidneys that can cause permanent damage and even kidney failure. This case study focused on the careful application of nursing interventions used to successfully manage the care of a geriatric female patient with diabetes mellitus and urinary tract infections. Through thorough research and analysis of the data collected, an effective treatment approach to address UTIs was developed. During the initial phase of this study, specific patient-related data were collected, taking into account the unique risk factors that affect older women, such as menopause, and hormonal changes that may predispose to UTI. These data were used as the basis for designing evidence-based personalized care interventions. Patient-centered care proved to be highly beneficial; significant improvements in her overall health and well-being were observed. Preventive measures to reduce recurrence of UTIs were implemented through a multidisciplinary approach involving physicians, nurses, and nutritionists. It is critical to emphasize that this experience provided a valuable knowledge base that can be extrapolated to the care of other older women who will face similar problems. The integration of personalized, evidence-based strategies in the care of geriatric patients with diabetes and urinary tract infection problems is essential to improve their quality of life and reduce long-term complications.

1. Introduction

Diabetes mellitus is a group of metabolic disorders that are characterized by elevated blood glucose levels, which represents a global concern due to its impact on public health. This condition is among the leading causes of death and disease worldwide, due to its association with a wide range of both acute and chronic complications (1).

Acute complications can include hypoglycemia and ketoacidosis, while chronic complications include cardiovascular disease, neuropathy, and kidney disease, among others. In addition to its health burden, diabetes also represents a significant economic challenge for health systems in different countries (2).

It is a serious public health problem, because currently, more than half a billion people on the planet suffer from it, with a prevalence of 9.3% among adults aged 20 to 79 globally, of which 79.4% live in low- and middle-income countries; This number grows exponentially over the years due to the bad eating and living habits that society currently leads. In addition, diabetic patients also face an increased risk of developing urinary tract infections and kidney complications (3).

Urinary tract infections and kidney complications can have serious consequences if not treated properly. These infections can affect both men and women, but a higher prevalence has been observed in women (4).

In addition, patients with type 2 diabetes have been found to have a higher risk of developing urinary tract infection compared to those with type 1 diabetes (5).

Urinary tract infection is clinically divided into two categories: uncomplicated and complicated. Uncomplicated urinary tract infection occurs in people who do not have any underlying disease or structural or neurological abnormalities in the urinary system (6).

Complicated urinary tract infection occurs in individuals who have circumstances that put the health of the urinary system at risk, which may include blockages in the flow of urine, urinary retention due to neurological problems, renal failure, kidney transplant patients, pregnancy, as well as the presence

of urinary catheters and other drainage devices (7).

Urinary tract infection is characterized by a series of uncomfortable symptoms that affect the quality of life of those who suffer from it. Common symptoms include dysuria, which can make the act of emptying the bladder a painful experience. In addition, affected people often experience the frequent need to urinate (frequency), even when the bladder is empty, which can disrupt daily activities (8).

The presence of hematuria is another concerning indicator of a possible infection, and is often accompanied by a feeling of pressure or cramping in the lower abdomen, which can lead to additional discomfort (9).

In hospitalized patients using urinary catheters, these infections can cause a number of health problems and increase morbidity and mortality in patients. Therefore, it highlights the importance of assessing the need for catheterization in hospitalized patients and promoting early catheter removal to prevent infections (10).

In 2023, it was observed that diabetes mellitus emerged as the main risk factor for urinary tract infections in these patients. In addition, the most prevalent microorganisms were identified as causing these infections, being E. coli, Klebsiella pneumoniae and Enterococcus spp (11).

This finding highlights the importance of addressing diabetes as a significant risk factor in the prevention and treatment of urinary tract infections. Understanding these factors is crucial to improve the clinical management and care of patients with diabetes with UTI (12).

In most cases, patients with urinary tract infections (UTIs) are treated on an outpatient basis with a conservative approach. It has been observed that age over 40 years represents a significant risk factor for both urinary tract infections and renal complications in diabetic patients (13).

This finding underscores the importance of continued surveillance and proper management of urinary tract infections in this patient population. Early detection and appropriate treatment are crucial to prevent serious complications and improve clinical outcomes in these cases (14).

The aim of this study is to apply the nursing process in the comprehensive care of diabetic patients with urinary tract infections and renal complications in the hospital setting and to highlight the importance of early diagnosis and appropriate treatment. The results of this review are expected to help healthcare professionals identify and effectively manage these infections. As the prevalence of diabetes continues to rise around the world.

OBJECTIVES

General objective

To apply the nursing care process in a comprehensive and effective way in the care of a diabetic patient who presents urinary tract infections and renal complications in a hospital setting.

Specific objectives

To identify the risk factors associated with the appearance of urinary tract infections and renal complication in the diabetic patient under study.

To analyze the efficacy of nursing interventions implemented in the management of urinary tract infections and renal complications in diabetic patients, evaluating clinical response, symptom resolution, and prevention.

To evaluate the effectiveness of nursing care applied to diabetic patients with urinary tract infection and renal complication.

The patient who presents is an individual with a history of diabetes, who attended the emergency area due to the presence of several symptoms including asthenia, dysuria, oliguria, tenesmus and pelvic pain. The doctor on duty assessed the patient, determining a possible urinary tract infection, especially considered due to his history of diabetes, which places him in a higher risk group for this type of

complications.

At the time of admission, the following vital signs were recorded: a blood pressure of 155/87 mmHg, heart rate of 110 beats per minute, respiratory rate of 19 breaths per minute, body temperature of 38 degrees Celsius and an oxygen saturation of 98%. These baseline values provided an overview of the patient's condition at the time of admission.

The results of laboratory and imaging studies complement the initial evaluation of the patient. A hemoglobin (HGB) of 11.5 g/dL, white blood cells (WBC) 14,140 was observed, which evidenced an infection, a hematocrit (HCT) of 33%, suggesting a slight decrease in the reference values. The platelet count was 398 thousand/mm^3 and the red blood cell count was 3.82 million/mm^3. Urea of 28 mg/dL. Creatinine of 1.2 mg/dL.

Urinalysis revealed a characteristic yellow color of the urine, but with a cloudy appearance. The urinary density is at 1025, while the urinary pH is 5, which indicated a slightly acidic environment in the urine. These findings are consistent with the possibility of a urinary tract infection.

Quantitative examination of C-reactive protein indicated a positive result with an intensity of two crosses (++), indicating an inflammatory response in the body.

Patient medical history

A 69-year-old female patient who has been dealing with non-insulin-dependent diabetes mellitus for the past 10 years. His diagnosis of diabetes was confirmed through laboratory tests and has been kept under control through oral medications and close follow-up with his doctor. His fasting blood glucose level has remained around 290 mg/dL in recent days, suggesting that health personnel perform optimal diabetes management.

The treatment regimen for her non-insulin-dependent diabetes mellitus was not only based on oral medications as prescribed by her doctor, in addition to a diet controlled in carbohydrates and sugars. However, her fasting blood glucose level has indicated values above normal parameters in recent days, suggesting optimal glycemic control, experiencing occasional episodes of hyperglycemia, but she has not required insulin in her treatment. The patient had a history of recurrences of urinary tract infection, which has been a cause for concern in recent years. He experienced symptoms such as dysuria during these episodes, received antibiotic treatment on several occasions to treat these infections, but his susceptibility to UTIs has persisted.

Among the tests that were performed on the patient, it was biometrics where a urinary tract infection was directly reflected, it cannot be directly specified which is the bacteria causing the infection because the hospital does not have urine culture tests. The treatment of the IVU consisted of the direct administration of antibiotics to eliminate the bacteria, adequate hydration must also be taken into account to favor the elimination of bacteria through urination and relieve their urinary symptoms. Close follow-up of the patient is essential to assess response to treatment and prevent potential complications, such as progression of infection to the kidneys or recurrence of urinary tract infection.

Comprehensive nursing assessment

Cephalocaudal assessment is a systematic approach used in nursing to perform a complete physical evaluation of the patient. This method involves examining the patient from head to toe, ensuring that all parts of the body are covered in an orderly and thorough manner.

It was observed at the level of the head, without the presence of abnormalities, the hair is clean and well cared for. No signs of lesions or masses were observed on the scalp, symmetrical eyes, the patient's vision was intact, no difficulties in fixing the gaze or changes in visual acuity, ears pinna well implanted, no signs of inflammation or secretions in the external ear canal, nose, no nasal obstructions or excessive secretions were identified, At the level of the mouth, oral mucous membranes are slightly dry, but no fissures or lesions were evident, slightly pale tongue with a white lining, the tonsils did not present redness or inflammation.

At the level of the neck, no masses or lymphadenopathy were palpated in the cervical nodes, the neck is mobile and without stiffness, which rules out signs of meningeal irritation. Symmetrical thorax, respiratory sounds are clear and symmetrical in both lung fields, there are no indications of chest pain or tightness, when palpating the abdomen slight sensitivity of pain was noted in the right lower quadrant, especially in this region, no masses or abdominal distension are perceived, in genitals, the patient reported discomfort, pain when urinating. Urination is frequent and the constant sensation of the need to urinate (tenesmus), presence of bladder catheterization, symmetrical upper and lower extremities, no ulcers or wounds were visualized in this evaluation.

The assessment of Marjory Gordon's 11 functional patterns is an essential tool in nursing practice, designed to comprehensively assess the patient's health status. This holistic approach allows all dimensions of the patient's health to be considered and addressed.

In the perception-management pattern of health, the patient presented several symptoms such as: asthenia, pelvic pain, dysuria and oliguria. These symptoms are influencing their perception of well-being and control of their health and, therefore, we show that this pattern is altered. In the metabolic nutritional pattern, the patient stated that she remains with good nutritional status. The patient reported that she eats her food 3 times a day, her weight is 63 kg and a height of 165 cm, which induces a body mass index of 23. The urinary elimination pattern is altered due to the symptoms of dysuria, polyuria and tenesmus, these symptoms determined a urinary tract infection, which can affect the frequency and comfort of urination. Likewise, the patient was placed with a bladder catheter that facilitated the monitoring and control of urine excretion.

In the activity-exercise pattern, asthenia and general malaise are affecting the patient's activity and exercise pattern. The resulting fatigue can decrease your ability to carry out normal daily activities and moderate exercise, which could influence your recovery and overall well-being. This pattern is altered. In the sleep-rest pattern, the patient stated that she maintains a good rest, fulfills her sleep hours correctly. In the cognitive-perceptual pattern, the patient described that she is aware of her disease and the symptoms, and accepted the treatment for her disease. She did not present memory deficits, nor alterations of the senses, but she did report pain in the pelvic region associated with dysuria, this pattern is altered.

In the self-perception-self-concept pattern, the patient demonstrated understanding of her diabetic condition and willingness to collaborate in the management of her diabetes and urinary tract infection. In the role-relationships pattern, the patient demonstrated an adequate level of openness and communication with her family and loved ones. Despite the symptoms of his disease. In the pattern sexuality – reproduction, the patient stated that she remains in a stable state. Her sexual function and reproductive capacity are not altered, the patient stated that she has 7 children, all from the same marriage. In the adaptation-stress tolerance pattern, the patient does not presented notable signs of distress or significant emotional disturbances. In the pattern of values and beliefs, the patient positively influences her management of the current situation. The patient stated that she was a Catholic, a believer that there is a God.

Nursing Care Plan

Through the analysis of the patterns, abnormalities were detected in the patient with the aim of establishing nursing diagnoses according to the NANDA classification. In the context of this case study, the following diagnoses were used.

The first nursing diagnosis includes: Acute pain (00132), from the

(12): Comfort, class (01): Physical comfort related to facial expressions of discomfort, verbal reports related to severe pain in the pelvic region. EVA 7. Urinary tract infection and kidney complications cause pain in the region due to irritation of the urinary organs and kidney inflammation. The assessment of this diagnosis was made according to the noc label, level of discomfort (2109), of the domain (05): Perceived health, of class (V): Symptomatology, will be sought as the first indicator. Pain: The patient

experienced severe pain in the pelvic region due to the UTI, which was reflected in a value of 2 in this indicator. After nursing interventions, these symptoms decreased to a level of 3 on the Likert scale. The moans were reflected at a level of 3, during the nursing interventions, it was possible to calm down reaching a level of 4 on the Likert scale. The patient's pain grimaces began with a level of 3, through nursing interventions, a level of 4 on the Likert scale was reached. The use of the VAS pain assessment scale allowed quantifying this discomfort, which is crucial to measure the effectiveness of interventions aimed at reducing pain and improving their general well-being. During nic interventions, pain management (1400), belongs to the field (01): Basic physiological, class (E): Promotion of physical comfort. The intensity, location and characteristics of the pain were evaluated

using a numerical scale, observing and recording physical manifestations such as moans and grimaces. Prescribed analgesics were administered, monitoring side effects and adjusting doses as needed. Warm compresses were applied to the pelvic region for intervals of 15-20 minutes, instructing the patient on their use. Frequent urination was encouraged by adequate fluid intake to reduce pressure and pain. Deep breathing and muscle relaxation techniques were taught, suggesting distracting activities such as listening to soft music. Information was provided about the cause of the pain associated with the urinary tract infection and emotional support was offered, ensuring open communication. Pain and physical manifestations were regularly monitored, adjusting interventions according to progression, and documenting assessments to ensure consistent and effective care. (See annex 2)

As a second nursing diagnosis we have: Disposition to improve urinary elimination (00166), of domain (03): Elimination and exchange, of class (01): Urinary function, related to the supply of adequate fluids to meet daily needs manifested by dysuria, where the patient presented a disposition to improve urinary elimination, a critical aspect in her condition of diabetes and renal complication. Her willingness to do so was manifested in her interest in maintaining an adequate fluid intake to meet her needs despite experiencing dysuria. The nursing team worked collaboratively with the patient to ensure that her fluid management is optimal and dysuria symptoms are reduced, thus improving her quality of life. The assessment of this diagnosis was carried out according to the label noc, urinary elimination (0503), domain (02): Physiological health, and class (F): Elimination. It becomes a fundamental indicator to evaluate your urological health. This result included the measurement and control of various aspects related to urinary elimination. The amount of urination was assessed through the indicators, where at the time of admission he reached a level of 3 on the Likert scale, through the interventions, he reached a level of 4 on the scale. The color of his urine at the time of his admission was a cloudy yellow hue reaching a level of 2 and at the time of his medical discharge it reached a yellow hue, not so clear, his level rose to 4 on the Likert scale. The pain when urinating at the time of admission reached a level of 2, through interventions his level rose to 3 on the Likert scale. Interventions nic, management of urinary elimination (0590), belongs to the field (01): Basic physiological, class (B): Control of elimination, a series of monitored the quantity, frequency and characteristics of the patient's urine, recording signs of urinary retention or difficulty urinating. The patient was encouraged to increase her fluid intake, mainly water, and the importance of maintaining adequate hydration was explained. A strict water balance was performed, prescribed antibiotics were administered, and response and adverse effects were monitored. A urinary catheter was inserted and maintained following sterile techniques, checking and cleaning the perineal area and catheter regularly. The patient and her family were educated on measures to prevent recurrent UTIs and the plan of care was explained. Regular assessments of renal function were performed using blood tests and urine tests, adjusting interventions according to outcomes and clinical course, documenting all findings and actions taken. These interventions helped to effectively manage urinary elimination, promoting the patient's recovery and well-being. (See annex 3)

As a third nursing diagnosis we have: Fatigue (00093), domain (03): Activity – Class exercise (03): Energy balance, related to the decrease in the execution of tasks manifested by disease states. The patient, who suffers from diabetes and faces a kidney complication, experienced noticeable fatigue that is directly related to the decrease in her ability to carry out daily tasks. These disease states have

influenced his vitality and his ability to perform activities that he previously performed without difficulty. Noc indicator, level of fatigue (0007), of domain (01): Functional health, of class (A): Maintenance of energy, will look for exhaustion as the first indicator, where at the time of admission the patient arrived with a level of 3 on the Likert scale, through nursing interventions the scale reached a level of 4. The myalgia at the time of admission reached a level of 2, through nursing interventions her level managed to reach a level of 3 on the Likert scale.

This result allowed quantifying and evaluating the presence and severity of fatigue related to their medical condition. Measuring the level of fatigue in this clinical context helps healthcare professionals understand how the disease and its complications can affect the patient's energy and quality of life. During the NIC, energy management (0180), field (01): Basic physiological, class (B): Activity control and exercise, various nursing interventions focused on specific activities were implemented. During the treatment of the urinary tract infection and renal complication, the patient's exhaustion and myalgia were assessed, administering analgesics to relieve muscle pain and promoting adequate rest by organizing regular rest periods and creating an environment conducive to sleep. Adequate hydration and nutrition were ensured, offering nutrient-rich foods and promoting adequate fluid intake. Emotional support was provided and the patient's progress was highlighted, adjusting interventions according to her evolution and documenting all observations and changes in her condition to ensure comprehensive and personalized care. (See annex 4)

As the fourth nursing diagnosis we have: Willingness to improve health management (00162), domain (03): Health promotion, class (03): Health management manifested by a desire to improve the management of symptoms related to: asthenia, pelvic pain, dysuria and oliguria. The patient presented a valuable indication of willingness to improve her health management. Her strong desire to improve symptom management demonstrated an active commitment to her well-being. The assessment of this diagnosis was carried out according to the label noc, knowledge: infection control (1842), domain (04): Health knowledge and behavior, class (S): Health knowledge. The indicator of signs and symptoms of the infection indicated that the patient arrived with asthenia, pelvic pain, dysuria and oliguria, reaching a level of 2 at the patient's admission, through nursing interventions her level reached a grade of 4 on the Likert scale. Treatment of the infection reached a level of 4 on the Likert scale. Proper control of your antibiotic treatment is of utmost importance to alleviate these symptoms. Nic interventions, control of infections (6540), from the field (04): Safety, from class (V): Risk control, in the care of the patient who presented the aforementioned symptoms, nursing interventions were implemented that address their disposition to improve health management. This included education about urinary and kidney infection, monitoring vital signs, proper administration of medications, promoting rigorous personal hygiene, monitoring urine output using intermittent catheterization to reduce the incidence of bladder infection, pain management, encouragement of hydration, ongoing monitoring and evaluation, emotional and psychological support, as well as education on the prevention of recurrent infections. These interventions were designed to improve the patient's understanding of their condition and optimize the management of infection and symptoms, promoting their long-term well-being in the context of this complex health situation. (See annex 5).

Evaluation

As a result of the nursing interventions implemented in the treatment of the patient's urinary tract infection, an improvement in the control of her infection was obtained. The results that were evidenced at the time of admission were white blood cells (WBC) of 14,140/mm³. Through nursing interventions, such as the administration of antibiotics, an improvement was achieved, reaching a white blood cell (WBC) value of 7,440/mm³. The patient's vital signs were monitored, with a blood pressure of 126/80 mmHg, heart rate of 68 bpm, respiratory rate of 18 rpm, and an oxygen saturation of 98%. Adequate control of their body temperature was obtained, reaching 36.3ºC, thanks to the correct administration of medications. This result is encouraging. It was indicated that medical and nursing interventions have been effective in the management of this complication. In addition, a multidisciplinary approach was implemented in the patient's care.

The patient had an uncontrolled glucose level due to her diabetes, with a fasting glucose of 290 mg/dL. During the days of hospitalization, nursing interventions focused on the comprehensive management of her diabetes. These interventions included taking insulin as prescribed, frequent monitoring of glucose levels, and education about a carbohydrate- and sugar-controlled diet. Her fasting glucose level dropped to 140 mg/dL. Your willingness to follow treatment and make lifestyle changes. Despite the complexity of her clinical situation, the patient experienced positive results in her care.

During her admission to the hospital, the patient presented with very strong pain in the pelvic region with a visual analogue scale (VAS). Initially, pain was assessed at 7 on the VAS scale. Various interventions were implemented, such as the administration of prescribed analgesics and the application of warm compresses to the pelvic region. Additionally, the patient was instructed in deep breathing and muscle relaxation techniques, and urination was encouraged through a bladder catheter, to Reduce pressure and pain. These measures allowed for effective monitoring and adjustments in pain management. At discharge, pain was assessed at 3 on the VAS scale. This reduction in pain intensity confirmed the efficacy of nursing interventions and the use of the VAS scale to improve the patient's comfort and well-being.

During her stay in the hospital, the patient experienced a high level of fatigue due to urinary tract infection and kidney complications. Nursing interventions focused on addressing this fatigue through a comprehensive care plan. Adequate rest periods were established, and balanced nutrition and adequate hydration were promoted. In addition, emotional support was offered and stress management techniques were taught. These interventions were effective in significantly reducing the patient's level of fatigue. At discharge, the patient reported feeling much more energetic and less fatigued, confirming the effectiveness of the care approach implemented to improve her well-being during her hospitalization.

Effective management of UTI, interdisciplinary collaboration in diabetes management, as well as the patient's commitment to self-care, are indicative of a successful approach to her care and a path to a better quality of life. These positive results support the importance of comprehensive and coordinated care in the treatment of patients with complex medical conditions.

DISCUSSION OF THE CASE STUDY

Diabetes is a chronic condition that affects the body's ability to regulate blood sugar levels, which can predispose to complications such as UTIs due to decreased immune function, which affects the bladder (15). In addition, the renal complication aggravates the patient's clinical picture, increasing the risk of mortality and morbidity. In this context, the data that were presented, such as laboratory values that indicated urinary tract infection, provide a solid basis for the planning and execution of nursing interventions (16).

A study conducted by Xiufen Wang, Liuting tan. (2023) and published in the Journal of Clinical Nursing, examined the incidence of UTI and renal complications in diabetic patients, with a particular focus on gender differences. The results indicated that women with diabetes had a significantly higher risk of developing UTI and kidney complications compared to men with diabetes. This finding highlights the importance of identifying and addressing specific risk factors in diabetic women to prevent these complications (17).

Another study carried out by Petros Loannou, Sofia Maraki. (2020) and published in the National Library of Medicine, determined that urinary tract infections are usually caused by microorganisms called Escherichia coli, Klebsiella pneumoniae, being the most common, where it was detailed that by not carrying out a correct administration of antimicrobials, these microorganisms will cause resistance in the infection, therefore there will be no improvement in the patient (18).

Compared to other studies, patient-centered care, including nursing interventions such as antibiotic administration as guidelined, careful monitoring of vital signs, blood glucose control, and promotion of hydration, has been shown to help improve clinical outcomes and reduce the risk of further

complications (19).

CONCLUSIONS

This case study highlights the importance of comprehensive nursing care in a diabetic patient. The accurate identification of risk factors associated with urinary tract infections and renal complication was essential to offer personalized and effective care. Using a holistic approach, it was possible to detect and address the variables that increased the risk of these complications, from glycemic management to the promotion of appropriate hygiene habits. This detailed understanding allowed for early and targeted intervention, thus mitigating the development and progression of associated complications.

The detailed analysis of the efficacy of nursing interventions in the management of urinary tract infections and renal complications in diabetic patients revealed a significant improvement in multiple aspects. In addition to the positive clinical response, a notable reduction in symptom duration and severity was achieved, contributing to faster recovery and a lower incidence of relapse.

A comprehensive evaluation of the effectiveness of nursing care in diabetic patients with urinary tract infections underscores the importance of patient-centered care. The results highlighted the ability of nurses to provide care that not only addresses the patient's immediate needs, but also focuses on the prevention and long-term management of complications.

References

1. Shahwan M, Hassan N, Shaheen RA, et al. Diabetes Mellitus and Renal Function: Current Medical Research and Opinion. Curr Diabetes Rev. 2021; 17(9):e011121190176. DOI:10.2174/1573399817999210111205532.

2. Vijay K, Neuen BL, Lerma EV. Heart failure in patients with diabetes and chronic kidney disease: challenges and opportunities. Cardiorenal Medicine . 2022; 12(1):1-10. DOI:10.1159/000520909.

3. ESMERALDA, Lezama Román Lina. Prevalence of urinary tract infections in diabetic patients, Pedro Ruiz Gallo Health Micro Network, Bongará, 2021. 2023.

4. TUDA, Cristina Martín; FERNÁNDEZ, Maria Pilar Carnero. Prevalence and factors associated with urinary incontinence in the eastern health area of Valladolid. Global Nursing, 2020, vol. 19, no. 1, p. 390-412.

5. POBLETE, Fátima Sosa; CRUZ, Daniel Marcial; JIMENEZ, Sugey Magdalena Castillo. Etiological Agents Associated with Urinary Tract Infection in Adult Patients with Type 2 Diabetes Mellitus. Ciencia Latina Revista Científica Multidisciplinar, 2024, vol. 8, no 1, p. 4649-4674.

6. Becerra, A. M., Parra, D., Trujillo, C. G., Azuero, J., García, S., Daza, F., & Plata, M. (2021). Uncomplicated urinary tract infection in women. Revista Urología Colombiana/Colombian Urology Journal, 30(02), 123-134.

7. Martínez Martínez, M. D. C. (2021). Bacterial resistance in complicated urinary tract infections in patients using urinary catheters hospitalized in the emergency department of the General Hospital of Zone No. 1 Aguascalientes.

8. QUISPE CAMPOS, Victor Bruno. Urinary tract infection in a patient with type II diabetesmellitus at the Arzobispo Loayza National Hospital, Lima 2022. 2024.

9. Cornistein W, Cremona A, Chattas A, Luciani A, Daciuk L, Colque ÁM, et al. URINARY TRACT INFECTION ASSOCIATED WITH BLADDER CATHETER. UPDATING AND RECOMMENDATIONS BETWEEN COMPANIES. Scielo. 2019; 1(78):258–64.

10. ESCOBAR-GUZMÁN, Evelyn Adriana, et al. Effectiveness of Urinary Tract Infection Prevention Measures in Patients with Bladder Catheters: A Systematic Review. AVFT–Venezuelan Archives of Pharmacology and Therapeutics, 2021, vol. 40, no 3.

11. BAQUE, María Fernanda Holguín, et al. Urinary tract infection associated with bacteriuria in older adults. Multidisciplinary Peer-Reviewed Scientific Journal PENTACIENCIAS, 2022, vol. 4, no 3, p. 289-302.

12. Komagamine J, Yabuki T, Noritomi D, Okabe T. Prevalence of and factors associated with atypical presentation in bacteremic urinary tract infection. Sci Rep. 2022 Dec 1; 12(1).

13. Spiess Julio, Fernandez I, Gadea P. Nosocomial urinary tract infections in a university hospital: prevalence, predisposing factors and etiological agents in moderate care wards. Rev urug med interna. 2022; 3(7):4–15.

14. Cárdenas L, Lourdes E. NURSING CARE IN PATIENTS WITH BLADDER CATHETERS IN INTENSIVE CARE AT THE NATIONAL HOSPITAL ARCHBISHOP LOAYZA. Universidad Peruana Cayetano Heredia. 2019; 18(2):345–65.

15. Weinstein E, Han J, Lautenbach E, Nachamkin I, Garrigan C, Bilker W, et al. A clinical prediction tool for extended-spectrum cephalosporin resistance in community- onset enterobacterales urinary tract infection. Open Forum Infect Dis. 2019 Apr 1; 6(4).

16. Menegueti M, Ciol M, Bellissimo R, Auxiliadora M, Gaspar G, Da Silva C, et al. Long-term prevention of catheter-associated urinary tract infections among critically ill patients through the implementation of an educational program and a daily checklist for maintenance of indwelling urinary catheters A quasiexperimental study. Medicine (United States). 2019 Feb 1; 98(8).

17. Wang X, Wang Y, Luo L, et al. Prevalence and Associated Factors of Urinary Tract Infection in Patients with Diabetic Neuropathy: A Hospital-Based Cross-Sectional Study. Metab Syndr Obes Diabetes. 2023;16:1261-1270. Published 2023 May 3. doi:10.2147/DMSO. S402156

18. Ioannou P, Plexousaki M, Dimogerontas K, et al. Characteristics of urinary tract infections in older patients in a tertiary hospital in Greece. Geriatr Gerontol Int. 2020; 20(12):1228-1233. doi:10.1111/ggi.14080

19. Piraux A, Faure S, Naber KG, Alidjanov J, Ramond A. Changes in the management of urinary tract infections in women: impact of the new recommendations on antibiotic prescribing behavior in France, between 2018 and 2019. BMC Health Serv Res. 2021 Dec 1; 21(1).