

## Nursing intervention in the care of patients with diabetes mellitus

Intervenção de enfermagem no cuidado ao paciente com diabetes mellitus

Intervención de enfermería en el cuidado del paciente con diabetes mellitus

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### ARTICLE HISTORY

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### ARTICLE INFORMATIONS

**Science-Metrix Classification (Domain):**

Health Sciences

**Main topic:**

Role of nursing with pre-surgical adult patients

**Main practical implications:**

Diabetes mellitus is a disease of high incidence, the article offers a wealth of ideas that can help in the better understanding of this disease from the perspective of nursing and its possible intervention strategies.

**Originality/value:**

Through this review, information was obtained on various nursing interventions carried out in different parts of the world with the aim of promoting self-care in patients with diabetes mellitus. These interventions reflect the interest in improving self-care in people living with this disease.

### ABSTRACT

Diabetes mellitus is a chronic disease that affects millions of people around the world. It is characterized by an imbalance in blood glucose levels, which can have serious long-term health consequences. Proper care of patients with diabetes mellitus is essential to control the disease and prevent complications. Nursing intervention plays a crucial role in the care of patients with diabetes mellitus. Nurses are trained to provide comprehensive and personalized care to these patients, addressing both the physical and emotional aspects of the disease. Objective: The objective of this research project is to know what diabetes mellitus is, its care and to analyze a case study that has a reliability and significance instrument. Method: The qualitative method of systematic review was selected through the PRISMA selection method, in which through the selection processes an article is defined which meets all the selection filters. Results: Through the participation of 34 nursing professionals who work in health institutions of the first level of care in the state of Puebla. Based on the results of the pilot test, a final test was carried out with a descriptive and cross-sectional design, using convenience sampling. The total sample consisted of 148 nursing professionals from a Health Center with Expanded Services in the State of Puebla. Conclusion: Through this review, information was obtained on various nursing interventions carried out in different parts of the world with the aim of promoting self-care in patients with diabetes mellitus. These interventions reflect the interest in improving self-care in people living with this disease.

**Keywords:** Patient care, diabetes mellitus, nursing, nutrition.

### RESUMO

O diabetes mellitus é uma doença crônica que afeta milhões de pessoas em todo o mundo. É caracterizada por um desequilíbrio nos níveis de glicose no sangue, que pode ter graves consequências para a saúde a longo prazo. O cuidado adequado dos pacientes com diabetes mellitus é essencial para controlar a doença e prevenir complicações. A intervenção de enfermagem desempenha um papel crucial no cuidado de pacientes com diabetes mellitus. Os enfermeiros são capacitados para prestar atendimento integral e personalizado a esses pacientes, abordando tanto os aspectos físicos quanto emocionais da doença. Objetivo: O objetivo deste projeto de pesquisa é conhecer o que é diabetes mellitus, seus cuidados e analisar um estudo de caso que possua um instrumento de confiabilidade e significância. Método: O método qualitativo de revisão sistemática foi selecionado através do método de seleção PRISMA, no qual através dos processos de seleção foi definido um artigo que atendesse a todos os filtros de seleção. Resultados: Através da participação de 34 profissionais de enfermagem que atuam em instituições de saúde de atenção primária no estado de Puebla. Com base nos resultados do teste piloto, foi realizado um teste final com desenho descritivo e transversal, utilizando amostragem por conveniência. A amostra total foi composta por 148 profissionais de enfermagem de um Centro de Saúde com Serviços Ampliados do Estado de Puebla. Conclusão: Através desta revisão foram obtidas informações sobre diversas intervenções de enfermagem realizadas em diferentes partes do mundo com o objetivo de promover o autocuidado em pacientes com diabetes mellitus. Estas intervenções refletem o interesse em melhorar o autocuidado das pessoas que vivem com esta doença.

**Palavras-chave:** Assistência ao paciente, diabetes mellitus, enfermagem, nutrição.

### RESUMEN

La diabetes mellitus es una enfermedad crónica que afecta a millones de personas en todo el mundo. Se caracteriza por un desequilibrio en los niveles de glucosa en la sangre, lo que puede tener graves consecuencias para la salud a largo plazo. El cuidado adecuado de los pacientes con diabetes mellitus es fundamental para controlar la enfermedad y prevenir complicaciones. La intervención de enfermería juega un papel crucial en el cuidado de los pacientes con diabetes mellitus. Los enfermeros están capacitados para proporcionar atención integral y personalizada a estos pacientes, abordando tanto los aspectos físicos como emocionales de la enfermedad. Objetivo: El objetivo del presente proyecto de investigación es conocer que es la diabetes mellitus, sus cuidados y analizar un caso de estudio que posea un instrumento de confiabilidad y de significancia. Método: Se seleccionó el método cualitativo de revisión sistemática a través del método de selección PRISMA, en el cual a través de los procesos de selección se definió un artículo el cual alcanza todos los filtros de selección. Resultados: Mediante la participación de 34 profesionales de enfermería que trabajan en instituciones de salud del primer nivel de atención en el estado de Puebla. Basándose en los resultados de la prueba piloto, se realizó una prueba final con un diseño descriptivo y transversal, utilizando un muestreo por conveniencia. La muestra total consistió en 148 profesionales de enfermería de un Centro de Salud con Servicios Ampliados del Estado de Puebla. Conclusión: A través de esta revisión, se obtuvo información sobre diversas intervenciones de enfermería llevadas a cabo en diferentes partes del mundo con el objetivo de promover el autocuidado en pacientes con diabetes mellitus. Estas intervenciones reflejan el interés por mejorar el autocuidado en las personas que viven con esta enfermedad.

**Palabras clave:** Cuidados prequirúrgicos; atención; ansiedad; abordaje psicológico; preparación prequirúrgica.

## INTRODUCTION

Diabetes mellitus is a chronic disease in which the body has difficulty regulating blood glucose levels. This can occur due to insufficient insulin production by the pancreas or the body's inability to use insulin effectively, known as insulin resistance. There are different types of diabetes mellitus, the most common being type 1 diabetes and type 2 diabetes. In addition, it is a relevant public health problem, as it is a chronic disease of major prevalence that is associated with high mortality and morbidity. Thus, currently around 382 million people in the world may suffer from this disease and by 2035 it is estimated that there may be around 592 million. Nursing participation in home care plays a crucial role in transforming this situation. Specifically, ambulatory care of diabetic patients plays a fundamental role in this purpose (Naranjo et al., 2019).

Care becomes a philosophy of life applied in professional nursing practice, which can be described as an activity that demands both personal and professional commitment. to preserve, restore and promote self-care of life based on the therapeutic relationship between nurse and patient. Within the work team, nurses play a relevant role at the organizational and scientific-technical level, since they have theoretical models and taxonomies specific to the discipline that are useful for planning and designing interventions for the individual (Ariztegui et al., 2020).

An example of a model of care is the one developed by Margaret Jean Watson, who considers human care as an essential therapeutic relationship between people. In her theory, Watson develops the Caritas Process or Process of Caring, which consists of ten charitable factors. This approach focuses on care directed towards existential, phenomenological and spiritual aspects, drawing inspiration from Metaphysics, Humanities, Art and Anthropology. To promote care, the Classification of Nursing Interventions (CIE) is used, which provides a broad and flexible guide for designing interdisciplinary care interventions in home settings. This approach relies on nurses' clinical knowledge and judgment to improve expected outcomes in older adults with diabetes mellitus (Morán et al., 2022).

In the specific case of older adults with diabetes mellitus, this care is required to achieve and maintain a healthy body weight, engage in regular physical activity, follow a balanced diet with fruits and vegetables low in sugar, saturated fats, and avoid stress and tobacco use. The importance of an adequate therapeutic behavior is also emphasized. Therapeutic behavior is based on fundamental pillars that include patient education, diet and nutrition management, regular physical exercise, the use of hypoglycemic drugs (such as oral antidiabetics) and insulin therapy, the treatment of associated diseases such as arterial hypertension, dyslipidemias, obesity, as well as the management of micro and macroangiopathic complications and psychological support for the patient (Fernández et al., 2019).

Diabetes mellitus (DM) is a group of metabolic diseases characterized by high blood glucose levels, and is considered one of the main causes of disease and death in today's society. In Venezuela, the prevalence of diabetes in 1997 was approximately 5.8% in adults over 40 years of age, and in most western countries it ranges between 2% and 5%. In addition to the associated high morbidity, subjects with type 2 DM have a risk of major and non-major cardiovascular events in people with type 2 diabetes mellitus is 2 to 4 times higher compared to those without diabetes. Because it is a chronic disease, diabetes affects both the social and psychological aspects of the individual, and carries significant costs for health services, as well as absenteeism from work, disability, limitations in quality of life. In recent years, there has been an increase in diabetes, largely due to the aging of the population, increased obesity and sedentary lifestyles. This has led to it becoming a public health problem that requires attention and efforts to prevent or treat complications early. In this context, nursing plays an essential role in the short- and long-term care of patients with diabetes (Beltran et al., 2021).

Diabetes can arise due to disorders in the secretion and action of insulin, or a combination of both, which cause alterations in the metabolism of carbohydrates, fats and proteins. Factors contributing to its development include family history of diabetes, environmental factors such as consumption of refined sugars, sedentary lifestyle, multiparity, recurrent miscarriages and, especially, obesity. However, all these factors always act on a genetic basis, which is the most important etiological factor (Castellanos y Pérez, 2020).

In the case of type 1 diabetes, formerly known as insulin-dependent diabetes mellitus, an autoimmune reaction against the beta cells of the pancreatic islets of Langerhans occurs due to a disorder in immunoregulation. This central pathogenic event triggers an autoimmune destructive process of the pancreatic beta cells resulting in significant insulin deficiency and a propensity to ketoacidosis. Although it can appear at any age, it mainly affects children and young people under 30 years of age (Jiménez 2020).

On the other hand, type 2 diabetes, formerly known as non-insulin-dependent diabetes mellitus, is much more common than type 1 diabetes. It can appear at any age, but mainly affects people over 40 years of age. More than 90% of all diabetics in the United States belong to this group. In type 2 diabetes, normal or elevated blood insulin levels are sufficient to prevent ketoacidosis, but insufficient to prevent hyperglycemia (Campos, Ovares y Arens, 2020) (Poveda et al., 2020).

The task of caregiving has two main objectives: to support people in coping with the problems that prevent them from meeting their basic needs and leading a satisfying life, to help them achieve the highest degree of well-being possible despite the symptoms and progression of the disease. Therefore, the aim of this research is to develop a nursing intervention focused on the care of patients with diabetes mellitus.

### Types of diabetes

**Type 1 diabetes (DM1):** Also known as juvenile or insulin-dependent diabetes, it usually develops in childhood or adolescence. In this type of diabetes, the body's immune system attacks and destroys the insulin-producing cells in the pancreas leading to an absolute deficiency of insulin. People with type 1 diabetes require daily insulin injections to control their blood glucose levels (Poveda et al., 2020).

**Genetic factors:** There is a genetic predisposition in the development of type 1 diabetes. Some people inherit genes that increase their susceptibility to the disease. However, having these genes does not guarantee that type 1 diabetes will develop as other factors are also involved (Cruz-Cobo y Santi-Cano, 2020).

**Autoimmunity:** In most cases of DM1, the body's immune system turns against the beta cells of the pancreas. The exact cause of this autoimmune process is unknown, but it is believed that environmental factors such as viral infections may trigger the abnormal immune response (Campos, Ovares y Arens, 2020).

**Partial or total destruction of beta cells,** whether due to autoimmunity, is related to the presence of certain human leukocyte antigens (HLA) on chromosome six and the appearance of antibodies directed against the islet cells or insulin. The manifestation of this destruction requires the influence of an environmental trigger, and the rate at which it occurs varies between individuals and may take from a few months (mainly in children) to several years (in adults) before clinical symptoms occur. Approximately 90% of affected individuals show autoimmune markers, such as antibodies against glutamic acid decarboxylase (GAD) and pancreatic islet anti-cytoplasmic antibodies (ICA), among others (Campos, Ovares y Arens, 2020).

**Idiopathic:** The etiology of this type of diabetes is not known, but it occurs in some forms of type 1 diabetes, characterized by insulinopenia and a propensity to ketoacidosis without evidence of autoimmunity. This form of diabetes has a strong hereditary component and is more common in patients of Asian or African origin (De la Fuente Coria et al., 2020).

In summary, type 1 diabetes develops when the body's immune system attacks and destroys the beta cells of the pancreas, resulting in absolute insulin deficiency. Genetic factors, autoimmunity and other factors may contribute to the development of the disease. However, more research is needed to fully understand the exact causes of type 1 diabetes.

**Type 2 diabetes (DM2):** It is the most common type of diabetes usually develops in adulthood, although it is increasingly common in children, adolescents due to increased obesity and sedentary lifestyles. In DM2, the body produces insulin, but does not use it efficiently, this is known as insulin resistance. Over time, the pancreas may produce less and less insulin. Management of type 2 diabetes may include lifestyle changes such as healthy eating, regular physical activity, in some cases oral medications or insulin injections (Poveda et al., 2020).

**Insulin resistance** is the earliest identified abnormality in the progression of this type and acquired factors contribute to this resistance. In addition to the risk factors mentioned previously, it is increasingly evident that hyperglycemia itself produces insulin resistance, known as glucotoxicity. Patients with this form of diabetes have varying degrees of insulin secretion deficits (in lean patients) and peripheral resistance to insulin action (in obese patients). Most patients with this form of diabetes do not require exogenous insulin to control their blood glucose levels or prevent ketosis, although they may need it to correct persistent or symptomatic fasting hyperglycemia or in combination with oral hypoglycemic agents. This entity constitutes a heterogeneous group without well-defined genetic markers (Fernández et al., 2019).

The diagnosis of this form of diabetes usually occurs in late stages because it can be asymptomatic for many years as the levels of hyperglycemia are not high enough to cause typical clinical symptoms. This increases the risk of developing chronic complications, such as nephropathy and neuropathy, which are often the reasons for consultation. Symptoms such as pain or burning in the feet (peripheral neuropathy), impotence in men (autonomic neuropathy), fungal and bacterial infections (alteration of the immune system) or cardiovascular problems may also occur (Anchundia et al., 2022).

Type 2 diabetes is a chronic disease in which the body does not use insulin properly or does not produce enough of this hormone to maintain adequate blood glucose levels. The following is a complete development of the causes of DM2.

**Insulin resistance:** In type 2 diabetes, the body's cells do not respond properly to insulin. This is known as the aforementioned resulting in the cells not being able to efficiently use blood glucose for energy. This insulin resistance can be influenced by genetic or environmental factors, such as obesity and lack of physical activity (Sánchez, Vega, Gómez, Vilema, 2022).

**Genetic factors:** There is a genetic predisposition to develop DM2; people with a family history of the disease have a

higher risk of developing it. However, having these genes does not necessarily guarantee the development of the disease. Other factors, such as lifestyle and environment, also play an important role (Anchundia et al., 2022).

**Obesity and lifestyle:** Obesity and being overweight are important risk factors for developing type 2 diabetes. Excess body fat, especially around the abdomen, contributes to insulin resistance. In addition, lack of physical activity and an unhealthy diet, high in calories, saturated fats and sugars, increase the risk of developing type 2 diabetes ( Vite et al., 2020).

**Aging:** Another risk factor for type 2 diabetes as we age, the function of beta cells in the pancreas may deteriorate and produce less insulin. Also, the unhealthy lifestyle often associated with aging, such as lack of physical activity and an unbalanced diet, can contribute to the development of the disease (Jiménez, 2020).

**Other factors:** Other factors that may increase the risk of developing DM2 include a history of gestational diabetes, metabolic syndrome (a combination of high blood pressure, high blood sugar levels, excess abdominal fat, and abnormal cholesterol levels), and certain medical conditions, such as polycystic ovary syndrome (PCOS) (Navarro, Jáuregui, Herrero, 2020). Both types of diabetes can have serious health consequences if not properly controlled. Maintaining blood glucose levels within a target range is critical to prevent long-term complications such as cardiovascular disease, kidney damage, eye problems, neuropathy and foot problems. Treatment of diabetes mellitus usually involves a combination of medication, healthy eating, physical activity and regular monitoring of blood glucose levels.

Nursing care and care varies according to the setting in which it is provided. In particular, the emergency area requires established protocols that allow for immediate action, as time management in emergency situations is crucial. Chronic diseases, especially in the older adult group where they are most common, generate significant emergency care. Health systems face a challenge due to the change in demographic distribution with an increase in the population of older adults, which currently represents about 13.1% in the Americas and is estimated to reach 18.6% by 2025 (De la Fuente Coria et al., 2020). This demographic change poses challenges for public health, as health needs differ according to age. Thus, a child and an older adult will require different types of care and will have different epidemiological profiles. Aging brings with it the emergence of various diseases, including chronic diseases that demand increased medical and nursing care. The emergence of chronic diseases is not only related to increased life expectancy, but also to changes in lifestyle habits, such as diet, physical activity and substance use that can affect health (Anchundia et al., 2022).

**Table 1.** Classification of Diabetes

<b>Classification of Diabetes</b>
Diabetes Mellitus type 1: Usually leads to an absolute insulin deficiency and destruction of the cells. a. Autoimmune b. Idiopathic
Diabetes Mellitus type 2: It has a relative insufficiency of insulin secretion which varies from insulin resistance.
Other specific forms of Diabetes: a. Defects in the genetics of Cell function. b. Defects in the genetics of insulin action. c. Endocrinopathies d. Diseases of the exocrine pancreas e. Induction by chemicals or drugs f. Rare forms of Immune mediated Diabetes g. Infections h. Genetic syndromes associated with Diabetes i. Rare forms of Immune mediated Diabetes
Gestational Diabetes Mellitus

**Source:** own elaboration (2023)

Currently, there is a convergence of these factors: unhealthy lifestyle habits and an increase in life expectancy, resulting in an increase in chronic diseases that require medical and nursing care.

**Care of the Diabetic Patient**

The importance of controlling blood glucose levels to reduce complications in patients with diabetes has been clearly demonstrated in long-term, prospective, randomized, interventional studies. The main goal of glycemic control in most diabetic patients is to reduce glycosylated hemoglobin to a level below two percentage points above the upper limit of normal. In addition, the intensity of treatment should be individualized and adjusted for each particular case. It is critical in the care of diabetic patients to simultaneously address other metabolic variables that are altered along with hyperglycemia. This involves strict monitoring of serum cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, as well as weight, body mass index (BMI), waist-to-hip ratio, and systolic and diastolic blood pressure (16). To minimize the incidence of acute and chronic complications, the following parameters should be adjusted according to each patient:

- a. Education of the diabetic patient is crucial to the success of all forms of treatment.
- b. A treatment regimen with insulin, oral hypoglycemic agents, or a combination of both, that promotes normoglycemia in the patient should be ensured.
- c. A balance between food intake, physical activity, and medication dosage should be encouraged.
- d. It is important to teach the patient to perform self-monitoring of blood glucose (SMBG), which replaces urine testing as a method of monitoring.
- e. Communication between the patient and health care personnel should be encouraged.
- f. Psychological support is essential.
- g. Reduction in caloric intake should be encouraged to minimize hepatic glucose production.
- h. Exercise plays a key role in the management of patients with type 2 diabetes, as it reduces insulin resistance, body weight, lipid profiles, and other cardiovascular risk factors (Jiménez et al., 2023).

**Nursing Interventions**

In order to plan and carry out nursing interventions in the care of diabetic patients, it is essential that the nurse performs a thorough assessment, establishes nursing diagnoses, and finally, designs the specific interventions to be carried out for the benefit of the patient. These interventions include both those initiated by nurses based on their own diagnoses and those indicated by the physician. In addition, these interventions should encompass direct care of the patient in the event of incapacity.

Interventions are classified into two types: those prescribed by the nurse (Independent) and those delegated by the physician (Dependent). In all cases, intelligent judgment is required on the part of the nursing professional, as they are legally responsible for carrying out the interventions appropriately. Patient assessment is the first step in the Nursing Care Process (NCP), which involves deliberately and systematically collecting data to determine the patient's health status. These data are used to establish nursing diagnoses, plan appropriate interventions, and subsequently evaluate their effectiveness.

The assessment includes interviewing the patient, where data are collected on symptoms prior to the diagnosis of diabetes, such as polyuria, polydipsia, polyphagia, skin dryness, weight loss, vaginal pruritus, and nonhealing skin lesions. Self-management compliance is also assessed and physical examinations are performed focusing on signs and symptoms of prolonged hyperglycemia, as well as physical and emotional factors that may affect the patient's ability to understand and perform self-care activities. Finally, diabetes education is an important aspect of this assessment stage (Table 2). In addition, blood glucose measurement is performed and in the case of patients with a diagnosis of type 1 diabetes, the presence of ketonemia and ketonuria is evaluated.

**Table 2.** Valuation parameters

<b>Valuation</b>
<b>Anamnesis</b>
Polyuria, polydipsia Weight loss Cramps and paresthesias Hypoglycemia (circumstances and number) Intermittent claudication Tobacco Foot injuries
<b>Evaluation of self-monitoring notebooks</b>
Exercise Diet Pharmacological treatment General and foot hygiene
<b>Exploration</b>
Foot Examination BMI weight Blood pressure (orthostatic and decubitus) Capillary blood glucose (when needed) Examination of puncture sites
<b>Diabetes education</b>
Annual interventions to reinforce it Initial educational program Education groups

Source: own elaboration (2023)



## METHOD

In the records and protocols of the city of Ambato, no research related to the proposed topic has been found using a systematic research methodology. In this research, the Systematic Review (SR) methodology was used. The method used to collect and classify the information was the PRISMA method, recommended to guarantee the rigor and reproducibility of the research in other contexts. The criteria applied for the selection of articles are described below:

Articles were included that:

- Eligibility criteria based on keywords such as: patient care, diabetes mellitus, nursing intervention.
- Articles published and approved within the last 5 years.
- Research that meets research criteria according to the proposed topic and a similar methodological process.
- Researches that provide interesting data.

In this way, the following research is also excluded:

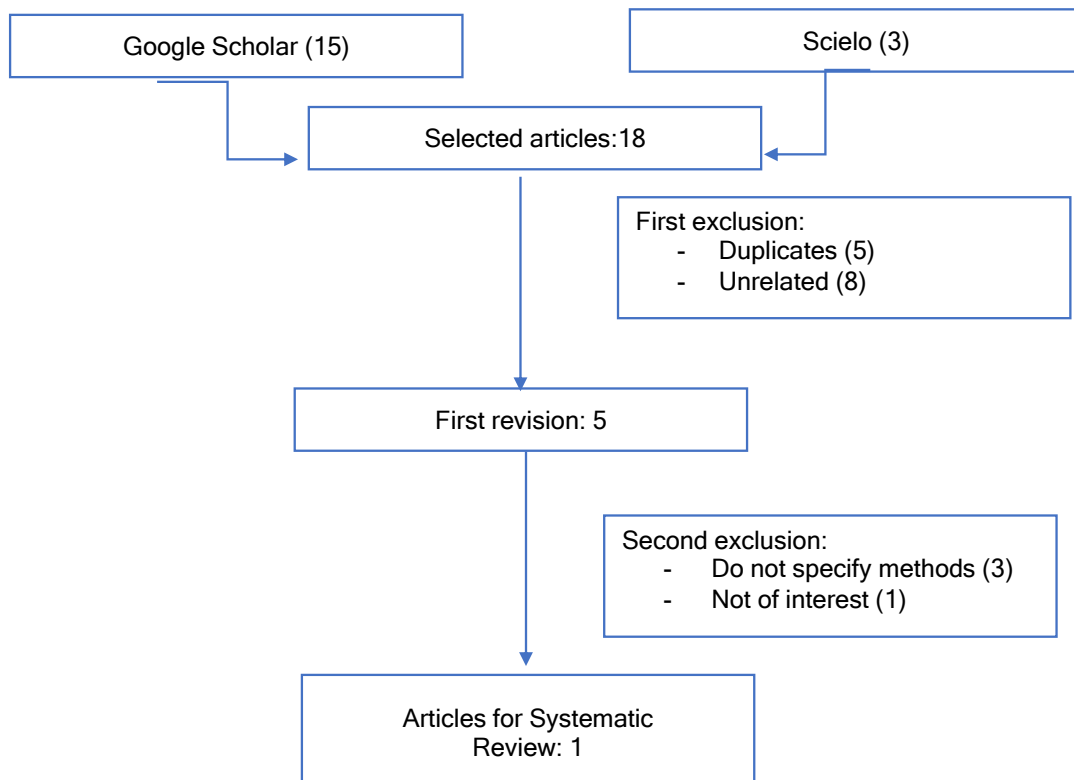
- Do not meet the inclusion criteria.
- Research that is not related to the proposed topic.
- Repeated research.
- Research that does not comply with scientific rigor about the methodological process.

The research was carried out through recognized search engines such as:

- Scopus
- Medline
- Researchgate
- Google academic
- PudMed
- Scielo
- Dialnet

In addition, international and national university repositories that provide relevant information to the research are considered. In this research, keyword-based search strategies were employed. An initial filter related to the year of publication of the articles was applied, considering that the most relevant were those published from 2019, up to the current date.

**Figure 1.** Selection of articles



**Source:** own elaboration (2023)

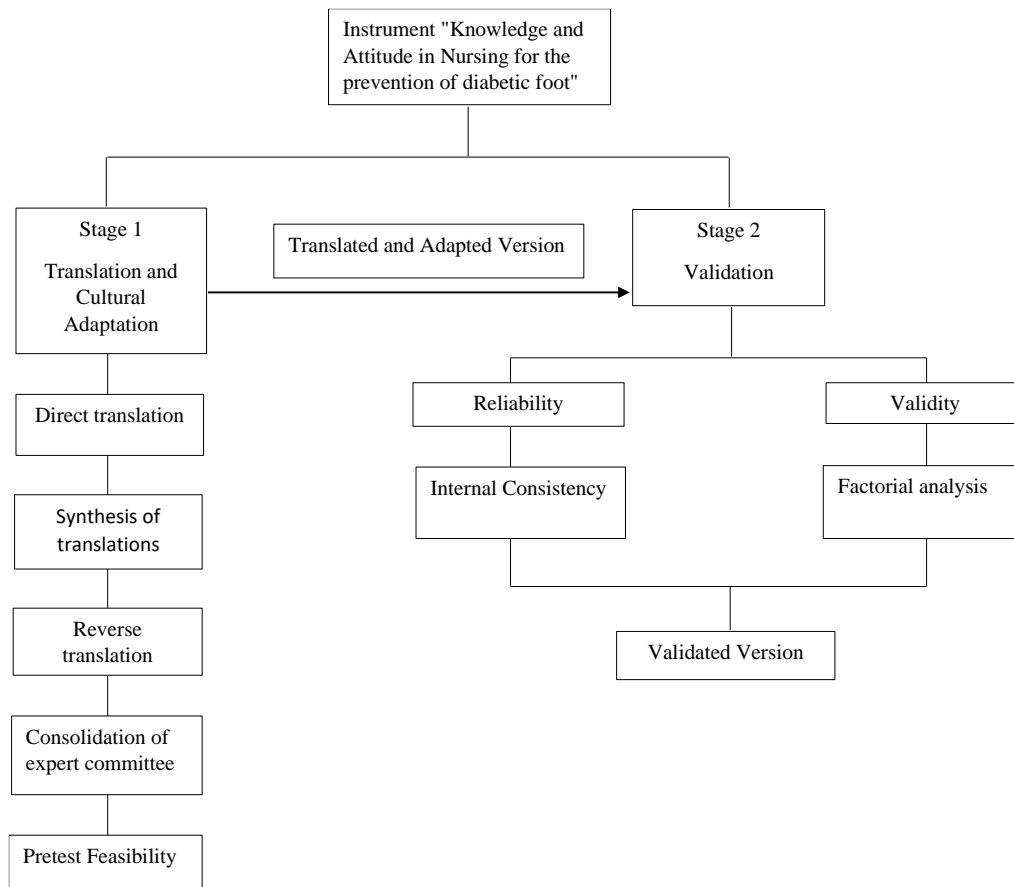
## RESULTS

In the study by Sarmiento et al. (17), the process of translation, cultural adaptation and validation (TACV) was carried out from January to August 2022. This process is essential when it is necessary to use measurement instruments developed in other countries. The TACV was carried out in two stages. In the first stage, which comprised five steps, translation and cultural adaptation were carried out. Two translators participated in the translation from English to Spanish: translator A, with experience in the translation of technical texts and proficiency in English, and translator B, whose mother tongue is English, but was unfamiliar with the concepts and objectives of the instrument. Based on the translations produced, the first Spanish version of the instrument (translation synthesis) was generated. Then a back-translation was carried out with the participation of two translators who were unfamiliar with the concepts of the instrument, which resulted in the first final version of the instrument (Sarmiento et al., 2023).

In the fourth step, a digital version of the instrument was sent to seven experts in wound care, who assessed the content validity using a Likert-type response scale. The scores and comments from each expert were compared and analyzed, which led to the second version of the instrument. In the fifth step, a pilot test was conducted with the participation of 34 nursing professionals working in primary health care institutions in the state of Puebla. Based on the results of the pilot test, a final test was conducted with a descriptive and cross-sectional design, using convenience sampling. The total sample consisted of 148 nursing professionals from a Health Center with Expanded Services in the State of Puebla. Data collection was carried out in virtual format through the Google Forms platform, with the authorization of the participants through informed consent, and voluntary and confidential participation was guaranteed (Sarmiento et al., 2023).

In the second stage, the instrument was validated using SPSS version 24 statistical software. The internal validity, rotated components matrix, Bartlett's and Kaiser-Meyer Olkin's Test of Sphericity (KMO), and Cronbach's Alpha coefficient were calculated. The research project obtained the approval of the Research and Postgraduate Studies Committee of the Faculty of Nursing-BUAP, with registration number SIEP/051/2022. The study was carried out in compliance with the Regulations of the General Health Law on Research (Sarmiento et al., 2023).

**Figure 2.** Cultural adaptation and validation of the instrument.



**Source:** Image taken from Sarmiento et al. (2023).

**Table 3.** Results of the analyzed article

Variable		f	%
<b>Age</b>	20-29	50	33.8
	30-39	63	44.7
	40-49	26	17.6
	50-59	9	3.9
<b>Sex</b>	Woman	115	77.7
	Male	3	23.3

**Note:** Table taken from Sarmiento et al. (2023)

Once the first Spanish version of the Knowledge and Attitude questionnaire for the prevention of diabetic foot, which consists of a total of 27 questions, was obtained, the content validation of the instrument was carried out. The questionnaire was sent to experts in the area of Wound Care, who answered a Likert-type scale instrument to evaluate the consistency of each item. In addition, the content validity ratio proposed by Lawshe was used to obtain a score for each question, which must be higher than 0.80 for the items to be considered adequate within the instrument. The result obtained was 0.84, which indicates an acceptable score for internal validity (17).

Once the content validity was obtained, the modifications proposed by the experts were made. Item number 2 was added to the knowledge questionnaire, which evaluates neuropathy using the tuning fork, Semmes-Weinstein monofilament and hammer. In addition, item 8 was added to the attitude subscale, which refers to the responsibility of educating patients with diabetic ulcers. With these modifications, the second version of the instrument was created. Subsequently, a pilot test was carried out with the participation of 34 nurses, and adjustments were made to the Likert-type response options in the subscale of knowledge for the prevention of diabetic foot, leaving as options "do not agree at all", "moderately agree" and "totally agree" (Sarmiento et al., 2023).

As for the Knowledge subscale on diabetic foot prevention, four components are described. However, in this study three components were identified through factor analysis: predisposing factors and characteristics of ulcers, ulcer complications, and diabetic ulcer care.

**Table 4.** Rotated Component Matrix, Diabetic Foot Prevention Knowledge Subscale.

Component	Item	Component		
		1	2	3
Predisposing factors and characteristics of ulcers	1. Neuropathy is responsible for loss of sensation in the extremities.	.606		
	3. Sensory neuropathy causes nerve damage and sensory deficits, which go unnoticed.	.635		
	4. Autonomic neuropathy is associated with dry skin, which predisposes to ulcer formation.	.444		
	5. Neuropathic ulcers are usually found in weight-bearing areas of the foot.	.444		
	8. The risk of amputation is greater with the presence of limb ischemia.	.715		
	10. The presence of osteomyelitis affects the healing process of ulcers in people with Diabetes.	.545		
	12. Mechanical offloading should be recommended to facilitate ulcer healing.	.685		
	14. Infected wounds with abundant exudate must be healed every 24 hours	.536		
Diabetic ulcer care	2. Neuropathy is assessed with the tuning fork, Semmes-Weinstein monofilament, and hammer.		.749	
	7. Neuropathy is manifested by cold skin and decreased pulses in the extremities.		.518	
	13. In a well-perfused foot, hyperbaric oxygen therapy is recommended for ulcer healing.		.518	
	15. The exclusive use of iodine dressings controls signs of infection in the wound.		.660	
Ulcer complications	6. Neuropathic ulcers cause pain.			.714
	9. The presence of slough is an indication of infection in diabetic ulcers.			.584
	11. Healing progress is not satisfactory if the wound bed presents epithelialization.			.632
	16. In an ulcer with abundant exudate the hydrogel allows autolytic debridement.			.458



**Note:** Table taken from Sarmiento et al. (2023)

In the subscale of attitude in diabetic foot prevention, four components were identified in contrast to the main authors who did not perform this specific analysis in this subscale. For this study, the following components are proposed: lack of attention to people with diabetic ulcers, denial in diabetic ulcer care, diabetic ulcer care and priority in diabetic ulcer care (Figure 4).

**Table 5.** Rotated Component Matrix, Attitude subscale in diabetic foot prevention

Component	Item	Component			
		1	2	3	4
Lack of care for people with diabetic ulcers	2. Diabetic ulcers do not need to be evaluated periodically	.526			
	7. I don't have time to advise each person on how to care for their feet.	.675			
	8. It is not my responsibility to educate patients with diabetic ulcers on how to reduce reulceration.	.745			
	9. I do not take into account the person's pain when healing diabetic ulcers.	.501			
Refusal to care for diabetic ulcers	10. I don't like treating diabetic ulcers.		.857		
	11. I do not get satisfaction in preventing diabetic foot		.811		
Diabetic ulcer care	1. Treatment of diabetic foot is more important than prevention of ulcers			.514	
	3. Diabetic ulcer care requires too much time to carry out.			.710	
	4. Preventing diabetic ulcers requires more time.			.640	
Priority in the care of diabetic ulcers	5. Compared to other areas of nursing care, diabetic ulcer care is a low priority task for me.				.828
	6. Monitoring diabetic ulcers is my priority.				.576

**Note:** Table taken from Sarmiento et al. (2023)

An instrument composed of 27 questions was developed, in which 16 items belong to the Knowledge subscale and 11 items to the Attitude subscale. The results obtained from Bartlett's test of sphericity and the Kaiser-Meyer Olkin adequacy index (KMO) in each of the subscales indicate that they are significant (Table 5).

**Table 5.** Bartlett's test of sphericity and Kaiser-Meyer Olkin (KMO)

Variable	KMO	X2	GI	p
knowledge for the prevention of diabetic foot	.86	606.7	120	<.001
attitude for the prevention of diabetic foot	.56	242.4	55	<.001

**Note:** Table taken from Sarmiento et al. (2023)

The reliability analysis of the instrument was then performed using Cronbach's Alpha coefficient, which evaluates the correlation between the variables and the internal consistency of the scale. In this sense, the Knowledge and Attitude subscales for the prevention of diabetic foot were examined, obtaining a Cronbach's Alpha value of .84 and .62 respectively. These results indicate an acceptable internal consistency in both subscales.

## DISCUSSION

The objective of this study was to culturally adapt and validate the Knowledge and Attitude instrument for the prevention of diabetic foot, due to the significant impact of type 2 Diabetes on the quality of life of people who suffer from it, as well as complications such as diabetic foot, which affect the quality of life and have implications in health care. The prevention of diabetic foot is an important challenge for nursing professionals in Mexico, and not having an adapted tool in this context, the importance of cultural adaptation is emphasized following the methodology proposed by Naranjo et al (18).

The evaluation by a committee of experts allowed a deeper analysis of the items, following the approach of Kaya and Karaka (19), who suggest improvements, changes or adaptations in the items of the instrument. Seven experts in wound care

participated in this study, which is similar to the study by Craus et al. (20), where the opinion of five experts, including academic members and statisticians, was also taken into account. In another study by Farzaei et al. (19), the opinion of five experts in nursing fundamentals and surgical nursing was obtained to assess the validity of the items.

A similarity with the original proposal of the instrument was found in the results of the components of the subscale of knowledge for the prevention of diabetic foot, where the predisposing factors and characteristics of ulcers were merged, while the other components remained the same (ulcer complications and diabetic ulcer care). Regarding the diabetic foot prevention attitude subscale, unlike Felix et al. (21), four components were identified. Furthermore, in relation to the reliability of the original instrument, different results were obtained in this study, with a higher Cronbach's Alpha, indicating greater precision in the application of the instrument in the Mexican context.

## CONCLUSIONS

Through this review, information was obtained on various nursing interventions carried out in different parts of the world with the objective of promoting self-care in patients with diabetes mellitus, it was evidenced that the lack of care in users can lead to some complications but the most relevant was the diabetic foot.

Diabetes mellitus, both type 1 and type 2, is a chronic disease that affects a significant number of people worldwide. Its prevalence has increased in recent decades, mainly due to factors such as the aging of the population, increased obesity and sedentary lifestyles. Type 1 diabetes is characterized by autoimmune destruction of the beta cells of the pancreas, leading to a total insulin deficiency. On the other hand, type 2 diabetes is associated with insulin resistance and impaired insulin secretion. Both types of diabetes present health risks and can cause long-term complications.

Blood glucose control is critical in the management of diabetes, as elevated blood glucose levels can cause damage to various organs and body systems. Regular monitoring of glucose levels, as well as adherence to an appropriate treatment plan, are essential to prevent complications and improve patients' quality of life. Nursing professionals play a crucial role in the care of people with diabetes. Their involvement ranges from education and emotional support to medication administration and promotion of healthy lifestyles. Developing nursing interventions tailored to each patient's needs is critical to providing comprehensive care and improving health outcomes.

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**Contribution of each author to the manuscript:**

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A. theoretical and conceptual foundations and problematization:	20%	20%	20%	20%	20%
B. data research and statistical analysis:	20%	20%	20%	20%	20%
C. elaboration of figures and tables:	20%	20%	20%	20%	20%
D. drafting, reviewing and writing of the text:	20%	20%	20%	20%	20%
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