

Self-Care in the Prevention of Diabetic Peripheral Neuropathy: A Systematic Review

Kary Patricia Cabrera-Sosoranga¹, Isabel Cristina Mesa-Cano^{1,2}, Andrés Alexis Ramírez-Coronel^{1,2,3}

¹Master's Degree in Postgraduate Care Management of the Catholic University of Cuenca, Ecuador.

²Nursing Career of the Catholic University of Cuenca, Ecuador.

³Laboratory of Psychometry, Comparative Psychology and Ethology of the Center for Research, Innovation and Technology Transfer (CIITT) of the Catholic University of Cuenca, Ecuador.

*Correspondence: Mesa Cano Isabel Cristina

Affiliation: Master in Postgraduate Care Management, Universidad Catolica de Cuenca, Ecuador.

Abstract:- According to the National Institute of Statistics and Census (INEC), from 2001 to the year 2019 in Ecuador, diabetes has become the second cause of death in the country with 4. 890 deaths, being a chronic disease that affects the population aged 10 to 59 years with a prevalence of 1.7%, being peripheral neuropathy one of the most frequent complications and perhaps the earliest, so it is important to detect it in a timely manner, because there is a 15 times higher risk of amputations than in the general population, this condition produced a negative impact on the quality of life of the patient. **Objective:** To examine the scientific literature on self-care in the prevention of peripheral neuropathy in diabetic patients. **Methodology:** With the purpose of obtaining relevant information that contributes to the knowledge that exists worldwide on the subject, an organized exploration of original articles was carried out through the following search engines: PubMed, Dialnet, Index, Scopus, Elsevier, SciELO, Redalyc, using the following keywords: "peripheral neuropathy", "self-care theory", "diabetes", "Dorothea Orem", "Diabetic neuropathy", "diabetic foot" and Diabetic foot, AND self-care, with a maximum age of 10 years and without language limitation. **Result:** Thanks to the literature reviewed, it was found that most of the studies are related indicating that most of the patients have a self-care deficit and reverence to the nursing care provided in this type of patients, based on the self-care theory of Orem, thus educating education in this way directed to the diabetic patient on self-care, even if they have not presented wounds or ulcerations, in order to prevent this disease, since there are studies that claim that peripheral neuropathy can be prevented by 80% if there is a good self-care. **Conclusions:** It was evidenced once again that timely education is a fundamental tool, focused on the prevention of neuropathy, demonstrating after interventions the effectiveness of educational talks, since the patient increases his level of knowledge which allows him to empower himself in his treatment and improve his self-care.

Keywords:- *Peripheral Neuropathy, Self-Care Theory, Diabetes, Dorothea Orem, Diabetic Neuropathies, Diabetic Foot.*

I. INTRODUCTION

Diabetes mellitus (DM) is currently considered a problem of great magnitude worldwide, due to its prevalence, physical and psychosocial consequences, it is in third place among the most serious affectations that humanity suffers daily and constitutes an endocrine alteration without cure, its complications diminish the quality of life by 10 to 30%, becoming the first cause of death, and it is estimated that 415 million people in the world suffer from it, and that by 2040 this figure will increase to 624 million (1).

DM has surpassed the figures being currently considered as a global epidemic of the 21st century; according to statistical data from the International Diabetes Federation (IDF), during 2017 there were 425 million people with this disease, and 79% lived in low-resource countries, it is also considered that every 30 seconds as a result of DM a person loses all or part of a lower limb and that this affectation occurs more in men than in women (2).

According to the International Diabetes Federation (IDF), by the year 2040 it is estimated that there will be 642 million people suffering from this disease, revealing that approximately twice the world population is developing this disease (3).

According to the Institute of Statistics and Census of Ecuador (INEC), diabetes is a disease that represents the second leading cause of death in the country, with 4,906 deaths reported in 2016, which means that in the last decade it has increased by 51%. It is notorious the excessive growth of this chronic degenerative disease in underdeveloped countries (4).

As a result of poor management of diabetes, complications arise, the most common being peripheral affectations, called diabetic neuropathies, about 5.1 million patients between 20 and 79 years of age died from this condition in 2013, which means that every 6 seconds a person died in the world (5).

Peripheral neuropathy (PN) is defined as the alteration of peripheral nerves attributable to DM, it is one of the most frequent complications, since it is found in two out of every three diabetic patients at the time of consultation, being a vascular disease that affects the human being in a functional and aesthetic way, and when it is not treated in time it is considered the main cause of non-traumatic amputations, exceeding 2 to 3 times the rate in men than in women. Eighty percent of foot ulcers and amputations can be avoided with self-care (6).

PN, a very frequent complication in people with DM, is a pathology caused by dysfunction of the sensory, motor and autonomic fibers of the peripheral nervous system in the lower limbs, and is also considered the main cause of injury and amputation (7).

PN triggers a set of symptoms such as: decreased protective sensitivity, pain, which does not allow the person to realize the initial formation of ulcers in the feet, in some cases the patient has muscle fatigue which makes it impossible to ambulate (8), thus affecting the quality of life of patients.

When observing the aforementioned figures, continuous education helps the person and the family member to take a tangible attitude towards the suffering of this disease in order to form a potential part of self-care, so that the development of complications such as ND can be avoided (9).

A primordial element in the process of diabetes is self-care, the person suffering from diabetes must rigorously comply with measures that allow him/her to achieve a healthy lifestyle, reducing the risk of morbidities that are attributed to this disease, taking as a starting point the learning of the same recommended by experts such as the World Health Organization (WHO), which considers that it is a fundamental piece that allows patients to empower themselves in their treatment (10).

It is deduced that by complying with basic DM care it will be possible to avoid up to 80% of mutilations, opting for basic self-care measures such as: foot care, use of appropriate footwear, skin and nail care, actions that are called self-care (11).

The limitations to make changes in lifestyle and poor self-care practices are the gap that trigger this health problem, where the nurse plays a key role through education on self-care practices. Therefore, it is considered of great importance the execution of this article since there is no current study where the effectiveness of self-care in the prevention of neuropathy is evidenced in order to generate new knowledge that can be used in the future, the present research is justified.

Given the alarming number of people suffering from complications such as ND and the essential role of self-care to prevent such consequences, the following questions arose: What are the types of self-care according to Dorothea Orem's theoretical model, what scientific evidence exists on

nursing care based on Dorothea Orem's self-care theory for the prevention of peripheral neuropathy in diabetic patients, and what is the best way to prevent peripheral neuropathy in diabetic patients?

The patient must maintain rigorous self-care attitudes, which implies changes in lifestyle, such as: maintaining a healthy diet, glycemic control, exercise, administration of prescribed medications and daily foot care. Dorothea Elizabeth Orem was the pioneer in proposing a theory of self-care, which she defines as: "actions that individuals take on their own to maintain life, health and well-being". Orem indicates that the person who is not able to maintain the aforementioned, presents a self-care deficit, which would warrant the intervention of a nursing professional (12).

Dorothea Orem considers her self-care deficit theory as a general model composed of three interrelated sub-theories: the theory of self-care (TAC), which mentions why and how people take care of themselves; the theory of self-care deficit (TDAC), which explains how nursing can help others based on their knowledge; and the theory of nursing systems (TSE), in this theory she indicates how nursing actions contribute to the restoration of the individual's health by overcoming the self-care deficit (13).

Orem considers self-care as a system of action that each person has to take care of him/herself with the purpose of maintaining his/her well-being, approaching the individual in a comprehensive manner (14).

The self-care theory, Orem defined nursing as the art of caring, and consists of several theories that certify the professional skill. This is related to the need to help the individual when he/she cannot do it by him/herself, providing care to maintain the life and health not only of the individual but also of the family and community, providing autonomy or dependence, including competencies such as: interpersonal relationship and providing measures that cover the needs and demands of self-care (15).

Self-care requirements, states that all self-care activities are assimilated over time and these are modified by different factors such as: beliefs, culture, habits and customs. The author mentions three basic survival requirements and describes three in her theory. These requirements positively promote health and well-being:(16)

Universal self-care requirements are the required goals that should be achieved through self-care these are: balance between air, water, intake and metabolic elimination. Harmony between activities and rest establishing a good functioning for human well-being, its promotion, and development (16).

Orem refers to the fact that the person is in constant limitations due to his health, which interferes in the decision-making process to take the necessary self-care measures to improve his quality of life (17).

The requirements of self-care in development aim to promote elementary conditions for life and the prevention of adverse situations, there are three sets of requirements: Provision of conditions that promote development, involvement in self-development, and preventing the effects of life situations that may affect health (18).

Health deviation self-care requirements refer to the type of care to be provided to people suffering from illnesses or living with sequelae including defects and disabilities. Measures taken to meet needs when health fails must be components of self-care or person-dependent care systems (18).

Teaching and monitoring self-care behaviors rooted in Orem's theory obtained over the life course can prevent and significantly decrease the rise of diabetic neuropathy infection (19).

The theory of self-care deficit (TDAC) is based on the impossibility of the person to take care of his/her health, it is a relationship between the human needs of self-care and the self-care deficit occurs when there is an imbalance between the aforementioned requirements. This is related to the fact that people live within limitations derived from health, which disqualifies them for perennial self-care and becomes unsuccessful and inconclusive (20).

Nursing systems theory assesses the degree of dependence on nursing actions, and proposes three typologies (20):

Fully compensatory, where the patient is unable to meet his or her own self-care demands, then a deficit exists. Here the nursing professional plays a very important role, where the patient becomes totally dependent until he/she is able to take care of him/herself and integrate self-care measures into his/her lifestyle (21).

Partially compensatory, here the patient has physical and cognitive abilities to take care of himself, but they are not enough to maintain his health and he needs the support of a professional (22).

Educational support, the individual is capable of self-care, but requires guidance. Nursing actions are aimed at helping patients to improve their ability to become involved in their treatment and to meet their own self-care requirements (22).

Interpretation from the conceptual elements of Dorothea Orem's self-care deficit theory aimed at the prevention of ND, in the theory of self-care, self-care deficit and nursing health systems, they refer to the ability of each person to maintain their health, which implies that the patient with diabetes should develop self-care activities to prevent ND, which significantly affects the quality of life of a person, since this disease causes changes in the peripheral circulation that over time can cause permanent and disabling damage, this condition is considered as a diabetic complication that mostly incapacitates causing social and economic damage to nations around the world (7).

According to Dorothea Orem's theory, self-care is the fundamental pillar that each person should put into practice over time and is executed in order to maintain the integral well-being of health, these being a set of skills that satisfy basic needs (23).

The self-care deficit influences the development of DN, and is currently evident in the number of hospital admissions for this cause, therefore, the nursing action within this theory plays a very important role in educating and sensitizing the patient and family, thus promoting self-care and proper compliance with treatment to avoid this complication (24).

Nursing care management based on Dorothea Orem's self-care theory from the beginning nursing was considered as a science dedicated to the art of health care, diagnosis and treatment of real or potential problems, it is worth mentioning that its actions are not empirical, they are subject to theories and models with scientific bases. Orem's theory focuses on well-being and conceptualizes nursing as the "satisfaction of the needs of the individual and his or her capacity for self-care". Several authors use his theory as a philosophical basis that guides the professional practice of nursing. Emphasizing the teaching of self-care for the prevention and control of ND (25).

Care management is defined as the process of planning, organization, motivation and control, which provides timely, safe, comprehensive care that ensures continuity of care (25). Thus, applying Orem's self-care theory through the nursing care process (PAE) is qualified as the main methodological support of the nursing area with respect to its process (10).

The teaching of self-care and the timely identification of the ND is based on performing a physical assessment, being this a preventive activity of great importance to counteract and control the development of this complication, the presence of an ulcer can cause loss of vitality of the limb, amputation, functional and psychological impairment becoming the most frequent disability of diabetics. It is necessary to provide knowledge about the control required for diabetes such as maintaining glycemia within normal values, having a balanced diet, exercise, daily foot care and maintain strict control of their disease, this will prevent, delay or reduce the appearance of certain alterations in the skin of the lower limbs (26).

The main objective was to examine the scientific literature on self-care in the prevention of peripheral neuropathy in diabetic patients. Based on the main objective, the following specific objectives were proposed: 1) To describe the types of self-care according to Dorothea Orem's theoretical model for the patient with diabetic neuropathy, 2) To determine the initial assessment in the self-care of peripheral neuropathy, 3) To identify in the scientific evidence the nursing care for the prevention of peripheral neuropathy in diabetic patients.

What are the types of self-care according to Dorothea Orem's theoretical model, What is the initial assessment in

the self-care of PD, What is the scientific evidence on nursing care for the prevention of peripheral neuropathy in diabetic patients?

II. METHODOLOGY

Tipo de investigación

A systematic review of the literature was carried out. The recommendations of the PRISMA statement were followed for this process.

Search strategy

The research will be carried out through tools such as: PubMed, Dialnet, Index, Scopus, Elsevier, SciELO, Redalyc. For the search we used keywords or descriptors, connected by means of the Boolean operator AND and OR. The search used keywords related to the desired objectives, according to the terms Mesh and DeCs: "peripheral neuropathy", "self-care theory", "diabetes", "Dorothea Orem", "diabetic neuropathy", "diabetic foot" (in Spanish) and "peripheral neuropathy", "self-care theory", "diabetes", "Dorothea Orem", "diabetic neuropathy", "diabetic foot" (in English); during the month of January 2021.

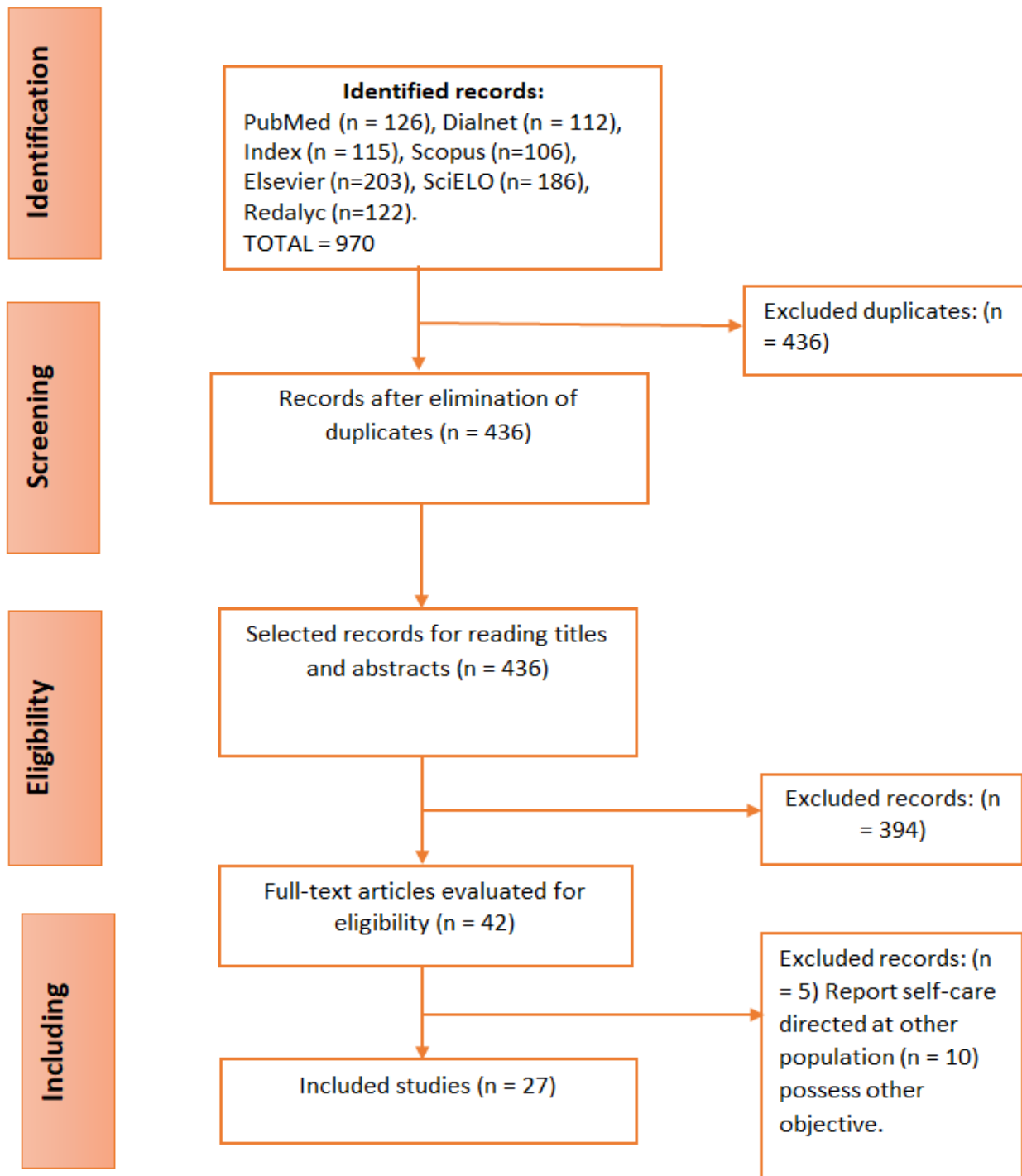


Fig 1:- Selection process of the studies included in the review.

A very rigorous systemic review of the scientific articles was carried out in a total of 970 of the different search engines in relation to self-care in diabetic neuropathy of which 436 were excluded for being duplicates, subsequently a screening process was carried out according to the exclusion criteria, 394 articles were eliminated, complying with the eligibility process 42, excluding articles that had a different approach to the topic, 27 remained.

Inclusion criteria

The following criteria were taken into account: Spanish and English language, year of publication: 2010 to 2020, original research articles, qualitative or mixed studies, quality of the articles.

Exclusion criteria

Thesis-type studies (undergraduate, graduate and doctoral), monographs and argumentative essays, and articles repeated from a previous search were excluded from the study.

Procedure

The first phase identified the topic and the formulation of the research question in the acronym PICO (Population, Intervention, Control and Outcome) format: "What types of self-care exist according to Dorothea Orem's theoretical model?" and "Examine the nursing process based on Dorothea Orem's self-care theory for the prevention of diabetic neuropathy?"

In the second phase, the inclusion criteria were: original articles related to self-care in the prevention of diabetic peripheral neuropathy, published in Portuguese, English and Spanish, with full text and online. The exclusion criterion was thesis-type studies (undergraduate, graduate and PhD), monographs and argumentative essays. Then, in the third phase, the primary selection of publications was made by reading the title and abstract.

In the fourth and fifth phases, the evaluation of the studies was carried out with more criteria (according to the objectives set), and the interpretation of the results obtained, in order to reach the sixth phase where the discussion and synthesis of knowledge was formed. The aim is to provide a systematic review with rigorous and exhaustive scientific information with studies with more and better pertinent information, without introducing information or publication bias, so that the contribution to the scientific community will be representative.

III. RESULTS

Most of the articles studied were based on cross-sectional methodology such as: Ibarra et al. (7), Rossaneis et al. (12), Soler et al. (14), Alcántar et al. (16), Balcázar et al. (22). There were also authors who conducted systematic review studies such as Botas et al. (3), Galeano et al. (4), Olmos et al. (11), Prado et al. (18), Naranjo et al. (20), Naranjo et al. (21). In contrast, Elías et al. (2), Hemmati et al. (19), used quantitative quasi-experimental studies. While other articles, such as Simplicio et al. (5), applied a quantitative bibliometric study. Quemba (6) and Soto (17)

were based on a correlational and relational study, respectively. Also, Ulloa et al. (10), Navarro et al. (13) which were clinical case studies. Most of the reviewed studies were elaborated by professional nurses (Table 1).

Types of self-care according to Orem's theories

Dorothea Orem's theory serves as a guide for nursing actions, planning and executing activities that promote self-care, based on scientific grounds, thus allowing to increase the level of knowledge and participation of the patient in their process, as noted by Quemba (6) when applying the self-care agency scale (ASA), obtained as a result that 23.7% had a very good level, 74.6% good and 1.7% low, from the point of view of Hemmati (19) obtained a percentage of 75% in relation to universal self-care, 58.3% in self-care requirements and 88.3% in self-care requirements and 88.3% in self-care requirements, (19) obtained a percentage of 75% in relation to universal self-care, 58.3% in the self-care requirements and 88.3% in the self-care of health deviation according to Orem's theory, from the position of Contreras et al., (23) exposes that according to the self-care capacity it was shown in a regular way with 88.89% of the total of the participants.

Initial assessment in self-care

Diabetes is considered as an incurable disease, and one of the most frequent complications is peripheral neuropathy where it is necessary to have a rigorous and strict control of the appearance of alarm signs such as those mentioned by García (1) where he reveals that 40% of patients develop a mild infectious process accompanied by cellulitis or skin erythema less than 2 cm; 30 %, moderate with the presence of cellulitis greater than 2 cm, affecting subcutaneous cellular tissue, tendon, muscle even up to the bone, and finally 30 %, severe cellulitis greater than 2 cm or involvement of TCS, tendon, muscle, bone, plus systemic involvement.

From the point of view of Ibarra et al, (7) indicates that 98% of patients have anatomical alterations or deformities, the most common sign being dry skin with 50%, hyperkeratosis with 33.5% and lastly fissures with 12.7%, onychomycosis with 32%, and during the physical assessment he observed the following results: I subsequently compared the presence of certain signs in patients with neuropathy (ulcer disease presence 2.1%, Achilles tendon reflex 43.4%, vibratory perception 89.6%, monofilament sensitivity 28.7%) and in others who did not yet develop this disease (Achilles tendon reflex 4.6%, vibratory perception 25%, monofilament sensitivity (4.6%).

Nursing care

Nursing care is a fundamental pillar for the early recovery of patients who develop this condition, ensuring comprehensive care according to the condition of each patient, focusing on promoting the importance of self-care, as expressed by Rossaneis (12) describes that women presented greater self-care in the feet, Men had good footwear habits (62.0%) and did not practice scalding their feet, only 10.7% said they did it, while 40.4% of women did it, taking into account Alcántar et al. , (16) states that 51.9% do not keep their feet dry, 57.2% do not use the appropriate

footwear, 80.5% do not go to a professional when they have a foot injury, 48.1% of the participants report never having their feet evaluated.

As expressed by Elias et al. (2), with respect to the level of knowledge of self-care, the experimental group (EG) obtained the following results in the pretest: low (33%) medium (45%) high (22%). In the post-test: low (15%) medium (33%) high (52%). As for the control group (CG), in the pretest the following results were obtained: low (47%) medium (25%) high (28%). In the post-test: low (47%) medium (34%) high (19%). In other words, the self-care of the feet of the group that received the educational intervention is higher than that presented by the CG.

According to Soto (17), he deduces that 90% of the participants have empirical knowledge about their disease,

74% have scientific knowledge, with respect to foot care 74% mention that they carry out self-care activities adequately, 70% have an adequate level and 4% a regular level and with regard to prevention strategies 50% of the group presented an adequate level. Table 1 describes the types of self-care found.

As stated by Balcázar et al., (22), 68.3% of the participants showed that their abilities and activities were inadequate, 31.7% showed an adequate level, in relation to self-care abilities, 75.0% had an inadequate level of self-care ability, 58.3% had an inadequate level of activities and according to the categories mentioned in the study as: 65% medical control, 58.3%-foot care, 56.7% exercise, were inadequate.

Table 1 Results by category.

Category	Characterization of the category
Orem's types of self-care	The self-care deficit theory centered on the T of self-care agency: support-education (2), (6), (10), (22)
	Nursing systems: fully compensatory, partially compensatory and support and education (4), (10), (19), (20), (21), (24)
	The patient must be aware of self-care in order to put it into practice on himself (5).
	T of the self-care deficit and its three related subtheories (9), (12), (17)
	Orem's 3 theories: the Self-Care Theory, the Self-Care Deficit Theory and the Systems Theory, related to the Nursing Care Process (NCP)(13), (18), (23)
	Compares nursing theories, highlighting Orem's theory as the most important (15)
Initial assessment in self-care	Universal self-care requirement: establishing a balance of air, water, food intake, elimination, activity and rest, etc. (16)
	Cellulitis, involvement of: TCS, tendon, muscle, bone, systemic and metabolic alterations (1).
	Burning, pain, loss of plantar sensation, edema, erythema, cold feet, loss of strength and atrophy of quadriceps, fragile foot and numbness (2), allodynia (3), (6), muscle weakness, vascular distention (8), atrophy of quadriceps (11).
Nursing care	Dry skin, (4), (8) hyperkeratosis, deformities, absence of the pedicle reflex (7)
	Educate and promote self-care of diabetic neuropathy according to Orem and applying the PAE (2), (4), (5), (7), (8),(9), (10), (12), (13), (14), (15), (16), (17), (18), (20), (22), (23), (24), (25), (26)
	Apply scales that measure the level of self-care: self-care agency scale (ASA) (6), needs assessment scale based on Orem's model (19). APD-UMA" questionnaire (2).
	Foot care: appropriate footwear, practices of scalding feet (12), (16), (17), (22), (26). Knowledge about foot self-care (2), (14), (17), (22), (26).

IV. DISCUSSION

During the systematic review, 27 articles were selected with a high scientific rigor that supported the main objective, which was to examine the scientific literature on self-care in the prevention of peripheral neuropathy in diabetic patients and based on the main objective, the following specific objectives were proposed: : 1) To describe the types of self-care according to Dorothea Orem's theoretical model to the patient with diabetic neuropathy, 2) To determine the initial assessment in the self-care of peripheral neuropathy, 3) To identify in the scientific evidence the nursing care for the prevention of peripheral neuropathy in diabetic patients.

According to the results found when studying the types of self-care according to Orem for the prevention of peripheral neuropathy in diabetic patients, it was found that the types of self-care are: self-care theory (self-care

requirements), self-care deficit theory (dependent-therapeutic care agent) and nursing system theories (fully compensatory system, partially compensatory system and support-educational systems), from the point of view of Galen et al, (4) emphasizes the nursing system subthemes, approaching the patient as a whole, providing care to prevent complications and integrating the patient to be part of his treatment as an active entity, regardless of the condition he is in: fully compensatory, partially compensatory, and supportive-educational.

The study identified that in the initial assessment of the patient for the prevention of peripheral neuropathies, premonitory signs should be identified: burning, pain, loss of plantar sensitivity, edema, erythema, cold feet, loss of strength and atrophy of quadriceps, fragile foot, dryness and numbness, as Elías et al, (2) indicates that during the evaluation of the study groups (experimental and control group) the following were obtained: Swollen feet (GE)17

=43 % (GC)12= 38% 0.667, reddened feet (GE)7 =18%(GC) 6 =19 0.891, pain (GE)20 = 50 1%(GC)5 =47 0.792, cold feet (GE) 17 =43%(GC) 10 = 31 0.327 numbness, tingling or cramping (SG)27 = 68 % (SG)21 = 66 0.867 loss of sensation (SG)5 =13%(SG) 5 =16 0.703 foot deformity (SG) 9 = 23%(SG) 5 = 16 0.464 previous amputation (SG)1 =3 % - 0.368

During the review it is shown that the nursing professional plays a very important role in providing timely and specific care to patients who are going through this disease contributing to recover health by means of educational or therapeutic actions, according to Pinilla et al, (2) states that 5.8% of patients report checking their feet every day, 92.2% keep their feet dry (interdigital spaces), 67.4% use socks, 45.9% use appropriate shoes, do not practice daily self-care 63.1% do not use lubricating lotion 78.8%, and do not go to the doctor when they see an injury 75.9%, do not look inside the shoe prior to use 55.7%, walk barefoot 30.2%, 10% use hot devices on the feet, 7. 8% use cream to prevent corns, and 85.3% do not have emotional support from family members for the care of their feet.

V. CONCLUSIONS

Diabetic neuropathy arises as a consequence of poor management and self-care deficit of the patient, which demands scientific knowledge, based on Dorothea Orem's model where the relevance of self-care and the participation of the nursing professional in activities for the prevention of complications is based, it also plays a central role thanks to this model, it has been possible to promote self-care practices in daily life, and thus promotes empowerment in the patient with respect to their health care.

In addition, there is evidence of the awareness of self-care required by the person affected with diabetic neuropathy in terms of improving or maintaining the state of health, through the possibilities offered by Orem's self-care model. This theory could be the solution to the major health problems that exist worldwide. It is worth mentioning that the different ways of practicing self-care are innate to each person and are mediated by: values, culture and beliefs.

There is evidence that diabetes self-care education programs reduce the risk of major complications such as diabetic neuropathy (DN) and improve adherence to treatment.

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