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NURSING CARE IN THE PREVENTION AND EARLY DETECTION OF DIABETIC PERIPHERAL NEUROPATHY: AN INTEGRATIVE REVIEW

Assistência de enfermagem na prevenção e detecção precoce da neuropatia periférica diabética: uma revisão integrativa

Cuidados de enfermería en la prevención y detección temprana de la neuropatía periférica diabética: una revisión integradora

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RESUMO

Objetivo: verificar as ações assistenciais de enfermagem voltadas para a prevenção e identificação precoce da Neuropatia Periférica Diabética (NPD) em usuários com Diabetes mellitus. **Método:** revisão integrativa da literatura, realizado nas bases de dados MEDLINE, LILACS, BDENF e SciELO. **Resultados:** foram incluídos na amostra nove artigos na amostra. Observou-se que a assistência de enfermagem apresenta-se pautada na educação em saúde como estratégia para prevenção da doença; na elaboração de planos de ação para o manejo efetivo dos fatores de risco associados, os quais predispõem o desenvolvimento e evolução da doença; na realização precoce do diagnóstico, por meio do rastreamento dos sinais e sintomas, exame clínico dos pés e demais testes preventivos durante a consulta de enfermagem e no estímulo para o autocuidado guiado

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pelo profissional de saúde. **Conclusão:** evidencia-se como fundamental a atuação do enfermeiro nas ações orientadas para a prevenção e tratamento precoce da NPD.

DESCRITORES: Diabetes mellitus; Neuropatias diabéticas; Pé diabético; Enfermagem.

ABSCTRACT

Objective: to verify nursing care aimed at the prevention and early identification of Diabetic Peripheral Neuropathy (DPN) in users with Diabetes mellitus. **Method:** integrative literature review, carried out in the MEDLINE, LILACS, BDENF and SciELO databases. **Results:** nine articles were included in the sample. It was observed that nursing care is based on health education as a disease prevention strategy; creating action plans for the effective management of associated risk factors, which predispose the development and evolution of the disease; early recognition of diagnosis by tracking signs and symptoms, clinical examination of the feet and other preventive tests during the nursing consultation and encouraging self-care guided by the health professional. **Conclusion:** it is clear that the role of nurses in actions aimed at the prevention and early treatment of DPN is fundamental.

DESCRIPTORS: Diabetes mellitus; Diabetic neuropathies; Diabetic foot; Nursing**.**

RESUMEN

Objetivo: verificar los cuidados de enfermería orientados a la prevención e identificación temprana de la Neuropatía Periférica Diabética (NPD) en usuarios con Diabetes mellitus. **Método:** revisión integrativa de la literatura, realizada en las bases de datos MEDLINE, LILACS, BDENF y SciELO. **Resultados:** se incluyeron nueve artículos en la muestra. Se observó que los cuidados de enfermería se basan en la educación en salud como estrategia de prevención de enfermedades; en el desarrollo de planes de acción para el manejo eficaz de los factores de riesgo asociados, que predisponen al desarrollo y evolución de la enfermedad; en la realización de diagnóstico precoz, a través del seguimiento de signos y síntomas, examen clínico de los pies y otros exámenes preventivos durante la consulta de enfermería y fomentando el autocuidado guiado por el profesional de la salud. **Conclusión:** el papel del enfermero en las acciones encaminadas a la prevención y tratamiento temprano del TNP se evidencia como fundamental.

DESCRIPTORES: Diabetes mellitus; Neuropatías diabéticas; Pie diabético; Enfermería.

INTRODUCTION

O Diabetes mellitus (DM) is a chronic disease characterized by high blood glucose levels due to a deficiency in the production or action of insulin, a hormone produced by the pancreas that is responsible for capturing circulating glucose and transporting it into the intracellular medium.[1] According to the International Diabetes Federation (IDF), DM affects approximately 537 million people worldwide, and it is estimated that this number will exceed 784 million by 2045.[2]

Among the main chronic complications found in people with DM, diabetic neuropathy (DN) stands out, which consist of a set of signs and symptoms of nerve dysfunction that may be local or diffuse.[3] Diagnosis of DN is made by exclusion of other causes, which often delays early recognition and, consequently, the initiation of treatment.[4]

Diabetic peripheral neuropathy (DPN) is considered a "diffuse, symmetrical, distal and progressive lesion of sensorimotor and autonomic fibers caused by chronic hyperglycemia and cardiovascular risk factors."[3] Prolonged hyperglycemia alters the metabolism of nerve cells, affecting sensory and motor nerves at central and especially peripheral levels, causing burning, tingling, numbness, shocks and altered sensitivity, especially to pain, texture and temperature, leading in more advanced cases to loss of muscle mass.[5-6]

It is known that DPN, associated with obstructive arterial disease due to atherosclerotic processes potentiated by DM, is mainly responsible for the development of diabetic foot, an ulcerative infectious process that culminates in a high number of amputations, in addition to high outpatient costs for health systems.[7-8] Therefore, a careful clinical investigation of factors predisposing to the development of DPN is relevant in order to detect early signs and symptoms that could lead to the onset of the disease. In this way, it will be possible to intervene with technical and educational measures to delay the worsening of existing lesions and to prevent the appearance of new lesions due to diabetic neuropathy.

Considering that DM and its complications are a public health problem, and given the need for integrated health actions to support users in the management of their disease, the present study aims to review nursing actions aimed at users with DM in order to prevent and detect the development of

diabetic peripheral neuropathy at an early stage. To this end, the following guiding question was used: "What is the scientific evidence on nursing care aimed at the prevention and early detection of diabetic peripheral neuropathy in users with diabetes mellitus?".

METHOD

One of the models of evidence-based practice was selected as a method, the integrative review, a method that consists in the synthesis and analysis of materials already prepared and published in journals, periodicals and scientific papers, with the purpose of creating and deepening new knowledge based on the results of previous research.[9] To carry out the study, six steps were followed, namely: (1) identification of the theme and the elaboration of the guiding question; (2) establishment of criteria for inclusion and exclusion of studies; (3) definition of the information to be extracted from the selected studies; (4) evaluation of the studies included in the integrative review; (5) interpretation of the results and (6) presentation of the review/synthesis of knowledge.[10]

The guiding question of the study was: "what is the scientific evidence on nursing care aimed at the prevention and early identification of Peripheral Diabetic Neuropathy in users with Diabetes mellitus?" To guide the development of this issue, the PICo strategy was used,[11] in which:

- P (Population): Users with peripheral diabetic neuropathies;
- I (Interest): Nursing Care;
- Co (Context): Prevention and early identification.

Articles were searched and selected from the following online indexing systems: American and Caribbean Literature on Health Sciences (LILACS); National Library of Medicine and National Institutes of Health (PubMed/MEDLINE); Nursing Database (BDENF); and Scientific Electronic Library Online (SciELO). Searches were performed using combinations, using the Boolean operator "and", between the following descriptors registered in DeCS (Health Sciences Descriptors) and MeSH (Medical Subject Headings) Diabetes Mellitus; Neurophatic Peripheral (Neuropatia Periférica); Nursing (Enfermagem).

The following inclusion criteria were considered in the present study: 1) studies conducted between 2012 and 2022; 2) articles addressing the desired topic, that is, nursing care aimed at the prevention and early detection of peripheral diabetic neuropathy in users with diabetes mellitus; 3) articles published in the LILACS, MEDLINE, BDENF and Scielo databases; and 4) articles published in full in Portuguese, English or Spanish. Exclusion criteria were: 1) studies that were not originals, dissertations, theses or case reports; 2) narrative or integrative literature review articles; 3) articles not available in full or not freely accessible; 4) duplicate articles.

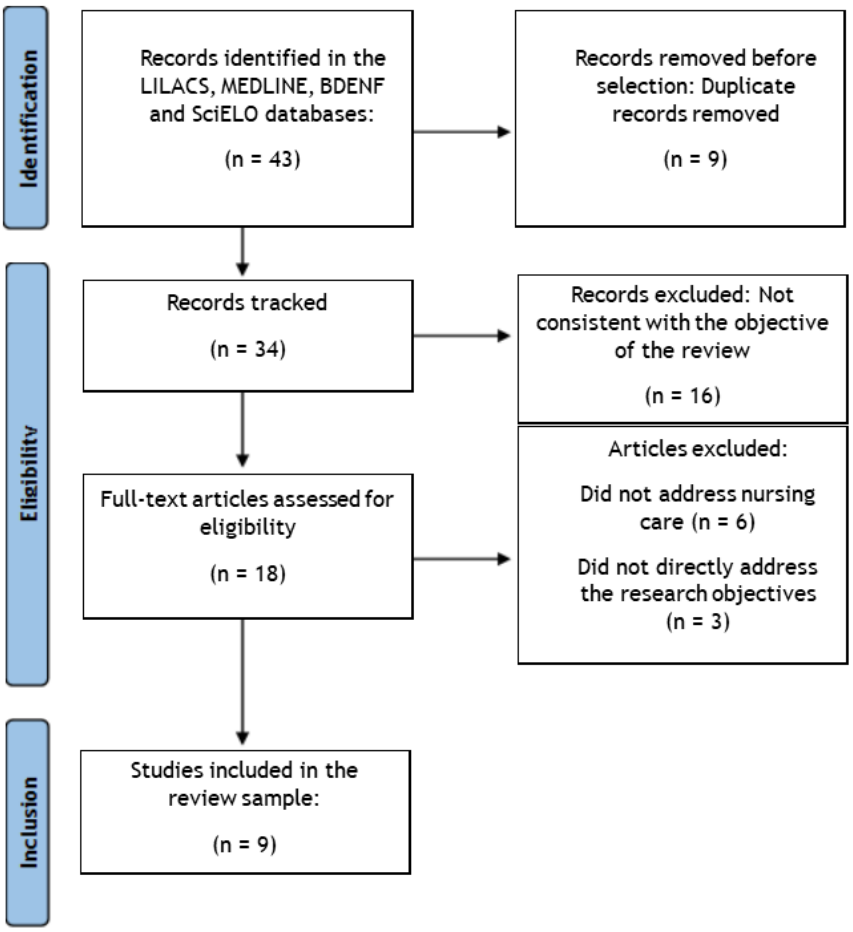
The selection and eligibility process of the studies followed the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).[12] To this end, the selection of the studies was carried out independently by two researchers, with a third researcher, the judge, to check for possible discrepancies in the results. First, the titles and abstracts of the articles were read in full to select the publications that met the inclusion criteria. A full analysis of the selected studies was then carried out using a semi-structured tool to identify information from the studies such as title, authors, year, country, methodological characteristics and main outcomes. The following levels of evidence were considered[13]: level I - meta-analyses and controlled and randomized studies; level II - experimental studies; level III - quasi-experimental studies; level IV - descriptive, nonexperimental or qualitative studies; level V - reports of experience; and level VI - consensus and expert opinion.[14]

Finally, it is worth noting that the study meets the ethical and legal principles of Resolution 510/2016 of the National Health Council, which includes research with information in the public domain.

RESULTS

Forty-three articles were initially identified. Of these, were excluded because they were repeated in more than one of the databases. Thus, 34 articles were analyzed by title and abstract reading, and 16 of these were excluded for not addressing the topic of this review. The remaining 18 articles were then read in full and analyzed for eligibility. After this reading, nine articles were excluded because they did not meet the inclusion criteria as did not answer the guiding question. Thus, nine scientific articles were included in this integrative review.[15-23] Figure 1 illustrates the process to define the final sample.

Figure 1. Flow diagram for the selection of articles in the review phases. Brazil, 2022.



Source: The Authors (2024)

Among the articles selected, it was found that they were all published in Brazil (100%),15-23 between 2014 and 2015. Regarding the type of study, it was revealed that all were observational, with eight studies on prevalence (88.88%),[15-22] and one on prognosis (11.11%).[23] Regarding the level of evidence of the studies reviewed, it was found that all (100%) had level IV, as they were descriptive and nonexperimental studies.

Table 2 shows the nine articles selected according to title, authors, year and country of research, journal of publication, study objective, method used and its corresponding level of evidence and main findings.

Table 2. Presentation of the characteristics of the articles included in the Integrative Review and their respective order numbers. Brazil, 2022.

Order	Publication year/ country and journal	Title and authors	Method and evidence level	Nursing outcomes and considerations
PI5	2014/ Brazil. Online Brazilian Journal of Nursing.	Autocuidado nos fatores de risco da ulceração em pés diabéticos: estudo transversal. [Self-care in diabetic foot ulcer risk factors: a cross-sectional study] Smanioto FN, Haddad MCFL, Rossaneis MA.	A cross-sectional descriptive-exploratory study was carried out among patients with DM registered in 38 Basic Health Units (UBS) in the city of Londrina-PR. Evidence level: IV	The prevalence of feet at risk of ulceration was 12.3%. Regarding self-care of the foot, the following variables were found to be clinically important: drying of the interdigit, self-assessment of the feet, taking footbaths, walking barefoot, type of footwear used daily and at the time of the interview, and foot hygiene. Changes in tibial and pedal pulses, altered capillary refill, the presence of bony prominences, vague hallux, claw and hammer toes, and loss of protective sensitivity in the feet were associated with the risk of ulceration. Nurses play an important role in health education by translating scientific knowledge into popular practice, presenting alternatives that are applicable to each individual's reality, promoting lifestyle changes and autonomy in self-care.
PI6	2018/ Brazil. Revista Brasileira de Enfermagem.	Avaliação do risco de ulceração em indivíduos diabéticos. [Evaluation of the risk of ulceration in diabetic patients] Dutra LMA, Novaes MRCG, Melo MC, et al.	This is a cross-sectional and analytical study carried out in the outpatient department of three public hospitals in the Federal District. Evidence level: IV	Neuropathic pain was present in 75.5% of people. Deformities and loss of plantar sensation were found to be directly related to the neuropathy. 34.2% of the sample had peripheral arterial disease and 65% were at risk of calcification. The results obtained represent a relevant contribution to nursing, as they confirm the importance of planning and professional action in the prevention of complications due to DM, through the implementation of a health education and action protocol.
PI7	2020/ Brazil. Revista Mineira de Enfermagem.	Avaliação do risco de ulceração nos pés em pessoas com Diabetes mellitus na atenção primária. [Evaluation of the risk of foot ulceration in people with diabetes mellitus in primary care] Lira JAC, Oliveira BMA, Soares DR, et al.	This was an analytical cross-sectional study of 308 patients over 18 years of age diagnosed with DM. Evidence level: IV	54.2% were at risk level 1 for foot ulceration. Changes in the marital status, occupation and having DM for more than 10 years, arterial hypertension, dyslipidemia, dry skin, deformities, ankle reflex and hallux vibration perception showed a statistical association with the risk of ulceration, whereas clinical examination of the feet and preserved sensitivity were protective factors. Given the importance of the clinical examination, it is up to nurses working in primary care to include a routine assessment of the feet of diabetic patients, with the aim of early detection of neurological, vascular and dermatological changes, in order to identify problems that may contribute to the ulcerative process.
PI8	2021/ Brazil. Revista de Enfermagem.	Comparação da dor e qualidade de vida entre indivíduos com e sem neuropatia diabética. [Comparison of pain and quality of life in people with and without diabetic neuropathy] Silva ACG, Stival MM, Funghetto SS, et al.	Cross-sectional study involving 251 participants with type 2 diabetes. Evidence level: IV	16.3% had neuropathy, 97.6% complained of chronic pain in the feet or calves, 51.2% of neuropathic patients had loss of protective sensitivity. The most common pain descriptors reported by neuropathic patients were: burning, tingling and stinging, and the quality-of-life domains affected were: pain, mental health and vitality. Once the diagnosis of DM has been confirmed, the nurse plays an indispensable role in the success of treatment and the prevention of complications, given the difficulty in detecting diabetic neuropathy. Nurses should be able to identify people at risk, perform a foot assessment and direct care aimed at prevention and early detection of DN cases.

Order	Publication year/ country and journal	Title and authors	Method and evidence level	Nursing outcomes and considerations
P19	2019/ Brazil. Revista de Enfermagem UFPE online.	Conhecimento do enfermeiro acerca dos cuidados com o pé diabético. [Nurses' knowledge of diabetic foot care] Arruda LSNS, Fernandes CRS, Freitas RWJF, et al.	This is a quantitative, descriptive, cross-sectional study involving 90 nurses from the Family Health Strategy (ESF). Evidence level: IV	It was noted that no nurse demonstrated satisfactory knowledge (score >95) in the prevention of diabetic foot. When analyzing the items on prevention of diabetic foot, there was greater knowledge for monofilament and neuropathic foot and lower performance for physical examination, with their knowledge classified as: unsatisfactory (45.6%) and contradictory (54.4%). The study highlighted the need for education and training of professionals so that effective preventive measures can be taken and become routine in primary care. It is well known that nurses need sufficient knowledge and skills to care for the feet of people with diabetes, to prevent, diagnose and manage complications.
P20	2018/ Brazil. Revista Brasileira de Enfermagem.	Grau de risco para úlceras nos pés por diabetes: avaliação de enfermagem. [Risk of foot ulceration in diabetes: nursing assessment] Lucoveis MLS, Gamba MA, Paula MAB, Morita ABPS	This is an exploratory descriptive study. Evidence level: IV	The elderly had dermato-neurofunctional risk factors and unfavorable clinical indicators, with 66% at risk 1, 16% at risk 2, 6% at risk 3 and 12% at risk 4. The study identified a gap in the risk assessment of complications of DM. The study identified a problem in the assessment of the feet and reinforces the need for the implementation of a specialized reference service aimed at the screening and prevention of lower limb complications in diabetic patients.
P21	2019/ Brazil. Revista Mineira de Enfermagem.	Percepção sensorial tátil alterada em pessoas com Diabetes mellitus: testando a concordância intervalores. [Altered tactile sensation in people with diabetes mellitus: testing the interval agreement] Noronha JAF, Felix LG, Porto MO, et al.	This was a cross-sectional study conducted with three evaluators to achieve agreement in the evaluation of the feet of diabetic patients treated in an outpatient clinic in Paraíba. Evidence level: IV	The main challenge for nurses is to be adequately trained to perform monitoring tests to detect altered tactile sensory perception (TSP). During the nursing consultation to monitor the person with DM, the patient should be instructed on foot care to prevent complications and, if necessary, referred for medical assessment to adjust glycemic control, as lack of control is one of the main factors in the development of altered tactile sensation. in the development of altered tactile sensation. Clinical examination of the feet, together with the patient's history, can confirm the presence and severity of peripheral neuropathy and peripheral arterial disease, the two main risk factors for foot ulcers. The trained nurse can carry out the necessary clinical examinations to determine the presence of neuropathy by means of sensitivity tests and can start early treatment to prevent injury.
P22	2017/Brazil. Revista Online de Pesquisa Cuidado é Fundamental.	Prevalência e fatores associados à neuropatia periférica em indivíduos com diabetes mellitus. [Prevalence and factors associated with peripheral neuropathy in people with diabetes mellitus] Brinati LM, Diogo NAS, Moreira TR, et al.	This was a cross-sectional quantitative study. Evidence level: IV	The prevalence of PND (polyneuropathy) was 36.89% and was higher in males, those with a longer duration of diabetes mellitus (DM) and those without plantar sensation (PPS). PND has a major impact on the lives of individuals if not detected early. The role of nurses in health education is highlighted, as their actions introduce self-care routines into the lives of patients, an important factor in disease prevention. In addition, nurses assume responsibility for clinical monitoring and control of the disease and its complications.

Order	Publication year/ country and journal	Title and authors	Method and evidence level	Nursing outcomes and considerations
P23	2018/Brazil. Revista Gaúcha de Enfermagem.	Riscos associados à mortalidade em pacientes atendidos em um programa de prevenção do pé diabético. [Risks associated with mortality in patients in a diabetic foot prevention program] Scain SF, Franzen E, Hirakata VN.	This was a retrospective longitudinal study that evaluated changes in the feet of outpatients assisted in nursing consultations. Data on clinical history and examination of the feet were collected from 918 medical records of a convenience sample. Evidence level: IV	In 10 years, the cumulative mortality attributable to peripheral sensory polyneuropathy was 44.7%, to peripheral vascular disease 71.7%, to the combination of the two 62.4% and to amputation 67.6%. After multivariate analysis, length of follow-up with nurses remained the only protective factor for mortality ($p < 0.001$). The study showed that patients who had their feet examined and followed up with a nurse over the years lived longer because the risks that led to changes in the feet were minimized. The consultations served to improve knowledge of foot hygiene, choice of footwear, how best to behave in high-risk situations, and what to do when injuries occur. Diabetes management guidelines, such as not smoking, maintaining good blood glucose control, controlling blood lipid levels and using medications correctly, have also been shown to be effective in preventing disease.

DISCUSSION

It was possible to observe that the articles included in this review addressed the role of nursing professionals in the prevention of diseases, either by acting in the management recommended for DM or by acting directly in the DPN already installed. Such action is based on care practices conducted from early diagnosis, carried out through the tracking of signs and symptoms, to appropriate treatment when the disease is already installed, in order to prevent the worsening of lesions.

For example, according to 6 of the 9 articles included in this review, the prevalence of ulceration risk in people with DM is higher if they have neuropathy, neuropathic pain and/or peripheral vascular disease.[16,18-19,21-23] This is mainly due to prolonged states of hyperglycemia in which there is a significant increase in the impairment of three main mechanisms responsible for the formation of ulcerative lesions in the lower limbs, namely the onset of neuropathy, the presence of ischemia due to peripheral arterial disease and the presence of associated infectious processes.[24]

It is now known that chronic hyperglycemia resulting from inadequate management of the disease is responsible for the damage to peripheral arteries and nerves through the formation of compounds called AGEs (advanced glycation end-products) resulting from the advanced glycation process, together with fatty acids resulting from metabolic disorders caused by DM.[25] Such compounds cause endothelial dysfunction and microvascular damage, leading to complications such as diabetic retinopathy, diabetic nephropathy and diabetic neuropathies.[25-26]

The sociodemographic data presented in the articles[15-18,22-23] of this review indicate that the population predominantly affected by diabetic neuropathy and ulcerative lesions is composed of women, over 59 years of age, with inadequate glycemic control and a time since diagnosis of DM of around 10 years. A possible explanation for this fact is that the search for health services is more frequent among the female population, something that is considered intrinsic to the Brazilian culture.[15,17,22-23,28]

According to the guidelines of the Brazilian Diabetes Society (2020), the increase in the number of people with DM is due to many factors, including: socio-demographic factors such as urbanization, relationship with food, sedentary lifestyle, associated obesity, and also the natural ageing of the population.[2] Epidemiologically, the heterogeneity of the disease that occurs in DPN raises the question of whether the complications of diabetes are due to hyperglycemia itself and/or its associated comorbidities. However, there is a consensus that cardiovascular disease, dyslipidemia and obesity are important risk factors for the development of chronic complications in DM.[2,29]

Therefore, some studies highlight the following as relevant risk factors for the development of DPN: cardiovascular problems such as systemic arterial hypertension and peripheral arterial disease; dyslipidemia; obesity; sedentary lifestyle,[17,20,23] in addition to socio-demographic aspects such as low income and low education.[15,17-18,20-21]

It is also noteworthy that the lack of periodic clinical examination of the feet is also a crucial factor in the prevention and early diagnosis of DPNs.[15,17-18,20-21,23-24] Regarding this, the articles obtained in the present review (54.5%) brought the

diabetic foot as the main element studied, since the neurological and vascular alterations caused by plasma hyperglycemia lead to 90% of cases of ulceration in the lower limbs, as already discussed.[30]

Among the diabetic neuropathies, distal symmetric polyneuropathy (DSP) has been observed at an increasingly earlier age in users, including those with pre-diabetes, affecting approximately 17% of users with more than five years of DM diagnosis and 42% to 65% after 10 years of diagnosis.[25-26] Its onset is usually insidious and, without treatment, the course is chronic and progressive. Neuropathy can affect thin or large nerve fibers, or both at the same time, resulting in symptoms such as paresthesia, burning pain, a well-localized pinprick or stinging sensation in the legs and feet, configuration of a boot pattern, hyperesthesia, and decreased or loss of tactile, thermal or pain sensitivity. These changes present in PSD increase the risk of ulceration due to the impairment of the protective sensitivity of the feet.[21-25,31]

In some cases of PSD development, in addition to neuropathic pain, which has been described as a limiting factor, and reduced sensitivity, there may be changes in balance, which can lead to reduced mobility, reduced muscle strength, and also psychosomatic changes such as irritability, depression, anxiety and reduced sleep quality.[32] It is therefore common for the presence of such changes to be associated with physical limitations and, consequently, lower indices of quality of life.[16-18]

It is therefore essential that the diagnosis of DN is made early and assertively by health professionals committed to the welfare of these users, in order to detect as early as possible any change in sensitivity.[21] There is a consensus among researchers in the field that early assessment of all users by clinical examination of the feet will benefit the users by identifying early signs and symptoms that may put them at risk of developing DN.[22] The collection of demographic data and clinical history is also relevant in the diagnosis of DN, as the exclusion of other causes for the identified symptoms is of paramount importance for the diagnostic validation of the comorbidity.[2]

In this sense, a group of researchers from the American Diabetes Association (ADA) conducted an integrative literature review in 2017 to gather the most relevant findings on DN, from which they concluded that all users with DM should be screened for the diagnosis of PD, starting at the time of diagnosis of type 2 DM and five years after the diagnosis of type 1 DM. The examinations must be repeated annually, and users who are considered to be pre-diabetic and have clinical manifestations that favor the development of neuropathy should also be evaluated. Regarding the parameters to be assessed, the recommendations indicate the need to evaluate functionality by observing strength, balance, proprioception and protective sensitivity, as well as symptoms, checking for the presence of: numbness, tingling, burning pain, shocks or stinging sensations. In addition to the 10g monofilament test, the presence of ankle reflexes and vibration, thermal and proprioceptive sensation should be assessed.[33]

This highlights the role of the clinical examination of the feet, which can be carried out by the nurse and aims to detect changes that, if detected early, are easier to treat and manage. Thus, among the articles included in this review that addressed the clinical examination of the feet[15,17-18,20-21,23], it was noted that data on self-care practices (correct nail trimming, local hygiene, adequate drying and hydration, and the use of appropriate socks and shoes) were examined; dermatological changes (presence of onychomycosis, interdigital mycosis, calluses, keratosis and skin hydration); neurological changes (test to check tactile, vibratory, thermal and pain sensations and reflexes); orthopedic changes (vague hallux, claw fingers, hammer fingers and bony prominences) and vascular changes (verification of pedal pulse, tibial pulse, dilated vessels and edema).

However, according to other studies, there are still failures in the proper performance of clinical examinations. These failures are of technical nature, such as the lack of knowledge on the part of health care teams on how to properly perform neuromotor tests, or of an operational nature, such as the lack of a standardized protocol for performing clinical examinations.[19,33]

To this end, the SBD[2] guideline includes as diagnostic recommendations the assessment of small nerve fibers, investigating thermal and pain sensitivity and sudomotor function, and of large nerve fibers through tendon reflexes, vibratory, tactile and positional sensitivity. Thus, It is recommended that the following tests be carried out on users with DM: The Modified Toronto Score, which evaluates thin fibers through scores for sensory tests of temperature, vibration, among others[34]; the Neural Stimulus Conduction Test (DPN-CheckTM), which uses a biosensor that measures the conduction speed of the sural nerve, formed by cutaneous branches of the tibial and fibular nerves, found on the side of the leg, foot and heel, making it possible to detect anomalies that indicate neuropathy at an early stage; 10g monofilament, consisting of the use of a nylon thread weighing 10g, where pressure is applied to different points of the feet, defined according to the protocol used.[35] And finally, the Neuropathic Impairment Score (NIS), which evaluates the responses obtained from the Achilles reflex test, carried out by percussion of the calcaneus tendon (Achilles), and from tests of vibration, pain and thermal sensitivity evaluated in the hallux.[36]

Nursing emerges as a central figure in this panorama. The results show that the diagnosis and follow-up of users with DM are mainly carried out in primary health care, which, as the user's gateway to the Unified Health System (SUS), becomes

the main means of disease prevention and health promotion. In this sense, the role of the nurse is crucial in the early detection of changes due to DN and also in the appropriate management of DM, with a care practice centered on education and health and the promotion of self-care. It is important to emphasize that the promotion of self-care should be done by trained nurses, using educational strategies that prioritize the autonomy of users, in the sense that they are technically able to carry out care actions on themselves.

In literature, it is possible to find statements about the process of permanent education in such a way that continuous health actions can reduce the incidence of chronic diseases, improving the quality of life of the targets of this care, in addition to contributing to the qualification of professionals, providing a higher quality of care. Thus, the role of nurses is based on the application of their technical-scientific knowledge, which is responsible for being a mediator between scientific knowledge and actions aimed at the individual and the community.[37]

This ensures that nurses have the necessary training to work on all aspects of the problem, from the identification of risk factors to the management of established DN. In this way, nurses work together to identify neuromotor changes at an early stage, and the data collected makes it possible to carry out the clinical, global and foot examination in a sensible and accurate way.[38] Once this has been done, it is necessary to develop an individual intervention plan to meet the user's needs. This plan will often include guidance on the use of medications and non-pharmacological routes to achieve adequate pain control, as well as guidance on hygiene and other foot care practices that are key to preventing complications.[39]

However, when analyzing the behavior and knowledge of these professionals in this area, a difficulty is identified in the preparation of such care plans and often even in the conduct of the clinical examination during the nursing consultation. This indicates the urgent need to invest in the training and re-training of nurses so that the processes of diagnosis, care and clinical management are carried out safely and with excellence.[15,19]

In view of the above, nurses have the opportunity to act as educators to empower individuals to manage their condition, with an improvement in metabolic indices and, consequently, in their quality of life. Therefore, the patient should work with the multidisciplinary team to establish individualized care protocols and to promote self-care supported by health education.[17,22] This reinforces the urgent need for nurses to be trained from a technical-scientific point of view to carry out a comprehensive, judicious and assertive nursing consultation in order to identify early any existing changes related to peripheral neuropathy, through clinical examination and tests considered as the "gold standard" for this, and to make the appropriate referrals for the appropriate management of the case.

CONCLUSION

In the present review, it was observed that nursing care in the face of DM, DPN and their complications is mainly evidenced by what concerns: health education as a strategy to prevent and/or postpone the onset of the disease; the elaboration of action plans for the effective management of the associated risk factors that predispose to the development and evolution of the disease; early diagnosis through the monitoring of signs and symptoms, clinical examination of the feet and other preventive tests during the nursing consultation and the promotion of user-centered self-care, but supported by the health professional.

Thus, it is clear that the role of the nurse is fundamental in actions aimed at the prevention and early detection of peripheral diabetic neuropathy, as well as its treatment when it is already present. In this sense, there is a growing need for nurses to be updated so that they are able to carry out all interventions with the necessary technical and scientific competence, from screening for possible clinical manifestations to the treatment of DPN itself, if necessary.

As a consequence, professional training becomes an essential component that will allow the processes to be carried out in a safe manner, according to the recommendations, leading to early diagnosis and intervention to prevent, postpone or avoid more serious complications, such as amputations, resulting from DPN. It is therefore concluded that the nursing actions include the prevention, diagnosis and treatment of DPN and require a technical, responsible follow-up, committed to the early detection of any changes that may exist and to the elaboration of an individualized care plan based on the promotion of self-care, supported and effective by the real formation of the bond between the nurse and the user.

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